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At last the financial disturbances and threatened industrial depression which have for some time been showing their effect by reducing the percentages of increase of railroad gross earnings have brought about the first actual decrease for over two years and a half. For the second week of November the gross earnings of 42 railroads, as summarized in the *Commercial & Financial Chronicle*, showed a decrease of 1.80 per cent. This is the first decrease so reported since the fourth week of February, 1905, when 50 roads reported a decrease of 6.30 per cent. in gross earnings. Gross earnings decreased in each of the last three weeks of that month, and for the month as a whole 117 roads reported a decrease of 3.01 per cent. in gross. Forty-seven roads reported a decrease of 3.39 per cent. in gross earnings for the second week in January, 1905. The loss in this one week, however, was swallowed up in the gains of the other three weeks so that this month showed an increase. Except for these four weeks in the winter of 1905 gross earnings have shown an increase up to this month in every week since July, 1904. In the fourth week of that month, 45 roads reported a decrease of 4.35 per cent., and in the third week 49 roads showed a loss of 1.54 per cent. in gross. For July, 1904, as a whole, 125 roads reported a decrease of 5.35 per cent. in gross earnings. Thus, the weekly figures, though for a much smaller number of roads, are typical of the trend of earnings throughout the bulk of the country's railroads. No figures of course are available for the current month. For October only 56 roads have reported to the *Chronicle*, these showing an increase of 5.91 per cent. in gross. In September 118 roads showed an increase of 9.71 per cent. following gains of 12 per cent. in August (121 roads); 14 per cent. in July (116 roads); 14 per cent. in June (121 roads); 18 per cent. in May (121 roads), and 21 per cent. in April (118 roads). The April increase followed a gain of 9 per cent. in March and was the high-water mark of the present year. Since then there has been a steady and continuous decrease. Now that it is a fact that gross earnings are falling off, it is important to consider the effect of this change. What this will be depends entirely on the extent to which earnings decrease. In many ways a moderate falling off in gross would be a relief and an advantage. One great reason for the rapid rise in operating expenses during the past year was the increase of traffic beyond facilities. One year of congestion and strain had been piled on another until the tracks, terminal facilities, locomotives, cars and most of all perhaps the men, both employees and officers, were overburdened by the continued pressure. A small falling off in gross earnings will give a breathing space in which to strengthen all these different factors in railroad efficiency and straighten out difficulties whose settlement has been brushed aside by the one urgent necessity of moving the traffic. How far the decrease in gross earnings can go before it begins to reduce net in the same proportion or faster is a question which the experience of the next six months will go far to answer.

THE WANING SUPPLY OF HARDWOOD IN THE UNITED STATES.

An apparently well founded guess as to when the hardwood supply will be exhausted has some interest both as an incentive to the development of substitutes and to planting and reforestization. The Forestry Bureau gives us some facts, some estimates and some well founded guesses. Heretofore we have had treatment by the bureau of the timber supply as a whole and not separating the hardwoods as it has done in this instance. In the past the center of hardwood supply may be said to have been in Ohio and Indiana; the far western states produce so little, that the quantity is negligible. At the present time the Ohio-Indiana supply, so easily accessible, has been exhausted and west of the Mississippi river the only state that need to be considered as a producer of hardwoods is Arkansas, which furnished about seven per cent. of the whole amount cut in the United States in the year 1906.

Of the hardwood trees cut into lumber, the production in 1899 was 8.6 billion board measure feet. In 1906 this cut was reduced 15.3 per cent. to 7.3 billion, although the wholesale prices of hardwood lumber advanced from 25 per cent. to 65 per cent. It is plain, therefore, that the decrease of production was due to a waning supply. The main production is now in the Lake states, especially in Michigan and Wisconsin, the lower Mississippi Valley and in the states containing portions of the Appalachian mountain ranges.

There is little hope for successful reforestization of lands adaptable to agricultural or other purposes, and this consideration disposes of any hope for other than sporadic reforestization in the Lake states and Mississippi Valley. The Forestry department believes, however, that there is a chance for successful work in the Green mountains, the Alleghany, the Blue Ridge and minor ranges

in the Appalachian group. The present lumber cut of 7.3 billion board measure feet is probably less than one-third of the amount of hardwood cut and used; for the records do not include the amounts cut for railroad ties, poles, piles, fence posts and fuel based on the measured cut, the guessed cut is therefore 25 billion board measure, or a trifle more than 3 billion cubic feet a year.

The amount of standing hardwood is also uncertain, but there are a number of reasonable bases for estimate, and the highest estimate is 50 billion cubic feet. At the present rate of cutting, therefore, the supply will be exhausted in about 16 years.

As to the chance of reforestization with a view to making a constant supply of three billion cubic feet a year, the Forestry department has made estimates by counties in the Appalachian mountain ranges south of Pennsylvania, and less accurate estimates in the mountains of Pennsylvania, New York and New England, and finds that there are 75 million acres primarily adapted for hardwood timber and having little or no value for other purposes. Most of this has been more or less closely cut over, but its reforestization is not considered difficult. The careful studies made by the department in East Tennessee show that under protection from fire and with good management, such lands are capable of producing 50 cubic feet of hardwood per acre per year and these figures applied to the 75 million acres in the Appalachians would make a possible annual production of between three and four billion cubic feet. Of course, at the beginning of the undertaking the maximum production would not be reached.

The Forestry department estimates that at the beginning the average production would be 10 cubic feet per acre, increasing gradually to the estimated 50 cubic feet per acre per year. It seems probable, therefore, that if active steps were taken now by this Government to so make permanent its hardwood supply the product would soon keep pace with the demand. There is a wide difference between constructive and destructive governmental enterprise. A man does more good, but attracts less attention when he is hoeing potatoes than when he is killing snakes.

THE LIQUIDATION IN RAILROADS.

It is a good time now when the word "liquidation" comes up so often in the vocabulary of stressful finance to recall briefly, for comparison and contrast, some of the phenomena of the panic of 1873 and the long strain which followed it for several years. That long crisis, it will be remembered, had its origin in railroad finance and, in one sense, "high" finance, though of a different, less malignant and less culpable type than the high finance of to-day. High finance then was simply a kind of honest craze for railroad overbuilding. It was only in a limited way speculation. It was still less stock watering. And it was not in any noteworthy degree stock manipulation, recapitalization, holding corporations and other recent devices of control. Municipalities shared in the frenzy of railroad construction and inflated ideas of its local benefits, and put the dollars of the taxpayers into railroad projects only to see the dollars swept by the board and the obligations incurred by "loan aid" bonds remain—and many of them remain unto this day. Still it was generally cash and not water that went into the unwise railroad enterprise. It was the railroad project, not the railroad security that, in the up-to-date adjective, was "undigested."

But the results were profoundly disastrous. As it was the railroads that brought on the 1873 crisis so it was the railroads that felt its brunt. Other and normal symptoms of general financial contraction—tight money, trouble in banking institutions, recession of business—were apparent enough; but it was upon railroads that the hardest shock fell and among the railroads that the longest and widest swath of calamity was cut. The shock came very suddenly and at a time when ever so many railroads were either under construction or had barely passed that stage. They were unfinished or had not reached a period of earning power and had also, at that initial stage, been incompletely financed. Hence the sequel in receiverships, foreclosures and reorganizations on a great scale attended with heavy losses in junior railroad securities and often in senior securities also. And it took years to "liquidate" and set the crippled roads on a bedrock of solvency during a painful process of cure in which the roads which were "going" concerns had to suffer too.

It is from history with its parallels and contrasts that we best learn. When we apply that "liquidation" experience beginning in the autumn of 1873 with the situation now, almost exactly a third of a century later, one finds some important elements of reassurance. On the negative side we of course have just had the high finance which we did not have then or, at least, not in anything like the same degree. But of late high finance has had some awful and disciplinary jars which ought to give it a quietus for a good while to come. On the same negative side we have the state and federal attack on capital mixing innocence and guilt in its assault. But is not experience now beginning to teach also federal and state authority its sharp lesson to be driven in yet deeper when the courts, on the one hand, and popular sentiment on the other, responsive to the pocket nerve, begin to get in their work? On the positive side the contrast with 1873 is cheering. There has been, to be sure, vast shrinkage in railroad values. But the financial trouble has not focussed on the railroads in anything like the same measure that it did in 1873 and after; it has hit them not as inchoate ventures half born or newly born but as going concerns with earning power often very high and not even yet much diminished; it has struck at a single branch of railroading, the financing of improvements, not at the original values; and the losses in such financing have fallen in a large number of cases on the underwriters, not on the railroad corporation. The long trail of railroad receiverships that began so quickly in 1873 has not begun now nor is there the slightest probability that it will begin at all. Even dividends remain almost entirely unaffected. The fundamental conditions of the two periods of "liquidation" are different—all the difference, in fact, between railroad stability and railroad infirmity and their relative power in resisting adverse market prices.

One can go farther and point out other disparities between the "liquidations" of 1873 and of 1907 in their bearing on railroad investments as well as others. The protective high organization of conservative capital at the later period might, for example, be contrasted with the looser and less effective organization of 1873 as well as differences in the character and size of the national prosperity. But such broader reasonings are needless. That liquidation of 1873 as a starting point of time and reaching through the painful years in railroad affairs which followed, finds in 1907 a railroad condition not only not analogous but, intrinsically, almost exactly the reverse. A few months, perhaps weeks, will set forth the fact in clearer terms of railroad stability.

AN EQUIPMENT ACCOUNT FOR EACH CAR AND LOCOMOTIVE.

Equipment accounting is a subject of particular interest at this time because the rules of the Interstate Commerce Commission covering this department of railroad accounting are still under discussion and are soon to be decided—in time to be put in force to cover the year beginning July 1, 1908. The Baltimore & Ohio's system of keeping a separate account with each locomotive and car is therefore of interest. A debit and a credit account is opened with each individual unit of equipment. This is done in books 18½ in. x 24 in. of 150 folios each. Each "folio" represents two facing pages, so that when the book is open on the desk the space occupied is 18½ in. x 48 in. The left-hand page is for the debit and the right-hand page for the credit account. Four such books are used for the individual record of locomotives and 60 for the individual passenger and freight car record.

Each page contains in three parallel columns space for the record of 50 cars, so that each book of 150 folios contains the complete debit and credit record of 7,500 cars. The debit page shows the number of the car, the month, day and year on which it was put in service, the builder and the original cost; these each in parallel columns. The last column shows the cost and character of betterments; which, for passenger cars, are listed under eight heads, as follows: Brakes, couplings, Westinghouse air signal, heating apparatus, vestibuled, capacity increased, number of wheels, lighting. There is a further column for remarks. This side of the account records the existence of the car, its cost and the kind and cost of betterments applied.

The credit account, on the right-hand page, records for the same 50 cars individually the month, day and year on which put out of service, how this came about, the book value of the car ("amount in rolling power"), how this amount was credited and a column for remarks. The credit side, therefore, records the going out of existence of the car, the amount at which it stood in the equipment account and the name of the account to which this amount is credited. Each page has a recapitulation at its foot, of the cost or value items of the 50 cars recorded on that page.

While it is not pretended by the company that this individual

record represents the actual value of each car based on a set percentage of annual depreciation, it is found valuable because it results in having a pretty accurate knowledge and necessitates constant and careful checking of the equipment, a process of which there can hardly be too much in keeping track of the rolling stock of a large system. The individual record was established at the time of the financial reorganization of the company. At that time the equipment was much overvalued and the records were in unsatisfactory shape. The company had an indicated profit and loss credit balance of about $50,000,000, but its rolling stock was badly run down and insufficient for its needs. At the time of the reorganization a revaluation of the equipment was made and the individual record established on the basis of this revaluation. For a time the locomotives and cars stood in the equipment record at this revalued figure or, in the case of new cars, at their original cost.

Then the company began to burden operating expenses with cost of replacement. Since that time the amounts charged to operating expenses for depreciation, and as credit to equipment account because of locomotives or cars put out of service, have been distributed among the individual cars and locomotives. This is a process which cannot be done with exactness. In practice it is done largely according to the judgment of the man in charge of the record, which is guided by the principle that the older the car, the more it will naturally require of the depreciation expenditures. Dividing the total amounts set aside for depreciation and because of destroyed cars, among the different cars individually, the total of the individual record agrees with the monthly summary of depreciation charges. Although this is an arbitrary process, the individual record has to be carefully checked over in doing it, which means increased watchfulness over each unit of equipment.

It is not always realized how difficult it is to keep track of 80,000 to 100,000 cars scattered over the 400,000 miles of track on the continent of North America. The individual equipment account helps to do this because the men in charge of the record (which is kept in the motive power department) check once a month with the men in the office of the superintendent of car service who keep the record of car movement. This is done in order to keep track for the individual car record of cars which have for one cause or another gone out of service. All cars which in this monthly check between the two departments are found not to have moved for a month are at once traced by the car service department. Thus the individual book-keeping account for each locomotive and car serves as an added check on the transportation records.

As the individual record is entirely too detailed to be used for getting a general view of the changes and the condition of the equipment as a whole, these facts are summarized in a monthly statement covering the whole rolling equipment. This is printed on a sheet 24 in. x 19 in., on one side of which is a summary of the individual physical changes in the equipment and on the other a summary of the result of the changes in the value of the equipment during the month and period from the end of the last fiscal year. Both statements are summarized under the four general classes of equipment: locomotives, passenger equipment, freight equipment and work equipment. In the value statement these four classes are summarized in totals.

Under the summary of physical changes, each of these general classes is separated into the individual kinds of equipment. Locomotives, for instance, are divided as passenger, freight and switching each with a further division for narrow gage, and electric motors. Passenger equipment has 18 sub-divisions, freight equipment 40, and work equipment 42 sub-divisions. The separate columns opposite each of these accounts are as follows: "On hand ....., 19...," "Bought during month," "Built," "Rebuilt," "Change of class," "Put out in error—now brought back," "Total additions," "Total to be accounted for," "Put out of service," "Sold," "Change of class," "Total deductions," "On hand ....., 19...," with a further column for remarks. This, therefore, is a complete summarized record of all equipment changes during the month. If more detailed information is wanted it can at once be found by turning to the individual record.

The statement of changes in value during the month and period is called a monthly balance sheet of rolling equipment. This has recently been revised to conform to the tentative rules of the Interstate Commerce Commission for equipment accounting. In this statement freight-train equipment is divided in two groups, wooden cars and steel cars. Opposite the classes are four double columns, one-half of the column for the month, the other half for the period. The first is for Capital Value (General Ledger Account—"Equipment"), the second for Depreciation (General Ledger Account—"Replacement"), the third for Changes in Equipment (General Ledger Account—"Equipment Renewals"), and the fourth a total of the three previous. As thus revised, the Interstate Commerce Commission headings of "depreciation" and "renewal" are kept separate. In the left-hand margin under each class of equipment, including the two kinds of freight cars, there are the following headings, each on a separate line:

Capital value as of———.
Increase in value by change of class.
New equipment added.
Equipment erroneously reported "Out of Service" now brought back.
Betterments applied.
Total,
From which should be deducted:
Deductions by reason of change of class.
Equipment put "Out of Service" by reason of sale, wreck or condemnation.
Monthly depreciation
Total deductions,
Net total,

This is as complete a summary of the changes in value of the equipment during the month as the statement on the other side of the same sheet is a summary of the physical changes during the same period. By the three parallel columns for Capital Value, Depreciation, and Changes in Equipment, a complete record of the changes in value as distributed among these three separate accounts is kept. The fourth column gives the total of the other three. Thus on the two sides of one sheet can be summed up all the changes in number (physical) and in value (financial) of the entire equipment of the Baltimore & Ohio system.

These two summaries combined with the individual locomotive and car record form a complete detailed showing and at the same time a clear and understandable record of the condition, value and changes in the equipment. Keeping the individual equipment record on the Baltimore & Ohio takes the whole time of two men at a cost of $175 a month, or $2,100 a year. As the books in which the record is kept are so ruled as to give three or, at a push, four lines for each locomotive or car, the books will last for many years. There is nothing automatic about this system. It does not ensure an accurate record of the value of each locomotive or car, nevertheless it records the life history, makes re-inventorying or corrections easy, and the results when summarized in totals by classes of equipment are likely to be much more accurate than when records by classes are the most detailed that are kept. The fact that the Baltimore & Ohio and the Pennsylvania both keep such records of each locomotive and car is some proof of the value of such individual equipment accounting.

Train Accidents in October.[1]

Our record of train accidents occurring on the railroads of the United States in October, 1907, includes 14 collisions, 14 derailments and three other accidents, 31 accidents in all. This record is not published in full except in the cases of the few accidents which are especially prominent—in the present instance four collisions and one other accident. The record of "ordinary" accidents—which term includes, for our present purpose, only those which result in fatal injury to a passenger or an employee or which are of special interest to operating officers—is given at the end in the shape of a one-line item for each accident, showing date, location, class and number of deaths and injuries. In this tabular statement italics are used to indicate the items concerning which details are given. This record is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to send a letter of inquiry to the railroad manager.

The record for October shows no collision or derailment of

[1]Abbreviations and marks used in Accident List:

rc.....Rear collision.
bc.....Butting collision.
xc.....Other collisions; as at crossings or in yards. Where only one train is mentioned, it is usually a case of a train running into a standing car or cars, or a collision due to a train breaking in two on a descending grade.
b.....Broken.
d.....Defective.
dr.....Defect of roadway.
eq.....Defect in car or engine.
n.....Negligence.
unf.....Unforeseen obstruction.
unx.....Unexplained.
derail.....Open derailing switch (negligence of engineman or signalman).
ms.....Misplaced switch.
acc. obst..Accidental obstruction.
malice....Malicious obstruction of track or misplacement of switch.
boiler.....Explosion of boiler of locomotive on road.
fire.....Cars burned while running.
Pass.....Passenger train.
Ft.....Freight train (includes empty, engines, work trains, etc.).
*Wreck wholly or partly destroyed by fire.
†One or more passengers killed.

startling magnitude, and in this respect October is the lightest month of the year, thus far. January had the Alta Vista collision and February the Williams-Bridge derailment; March, Colton, Cal.; May, Honda, Cal.; July, Salem, Mich., and September, West Canaan, N. H. June had the Hartford collision, killing eight. April and August were free from cases causing more than six fatalities, and in the present report the maximum appears to be three.

Perhaps the worst case in October is the collision at Rudd, N. C., on the seventeenth. The only report which has been published concerning a cause is that it was due to a misplaced switch opened by the front brakeman of a freight train. Press despatches say that this brakeman had been on duty for 23 hours without sleeping, but this is a statement which lacks confirmation. The facts will probably come out in the government report.

The collision at Chicago, on the 19th, is peculiar in that Engineman Cushing, an experienced runner, had with him, as passenger on the engine, another runner of experience who testified that Cushing was at fault for overrunning a signal, having taken his fireman's word for it that the signal indicated "all right." The collision occurred not far from the terminal station and the trains were running at very moderate speed. It occurred at 7 o'clock in the evening, a westbound passenger train running through a crossover and striking an eastbound train on the adjacent main track.

The collision at Leiters Ford, on the 25th, affords an illustration of lax discipline in block signaling. A freight train entering a side track broke in two before it had fully cleared the main line, but the block signalman, who was unable to see the whole of the train, assumed that it had cleared the main line when it had not.

The collision at Dallas, Tex., is notable as being the first train accident in the history of the Missouri, Kansas & Texas Railway in which a passenger has been killed. The passenger train was filled with about 1,000 excursionists. Only one of them was fatally injured, the other two fatally injured being an engineman and a fireman.

Near Fontanet, Ind., on the 15th, all of the windows in the cars of a passenger train of the Cleveland, Cincinnati, Chicago & St. Louis were broken by an explosion at a powder magazine, four miles distant. The explosion destroyed a village, killed 20 or more persons and injured several hundred others.

Train Accidents in the United States in October, 1907.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	Inj'd.
2.	Boston & Maine	Worcester.	bc.	P. & Ft.	0	8
12.	L. & N., St. L. & S. F.	Pratt City.	xc.	P. & Ft.	1	8
12.	Nor. Central	Troy.	bc.	Ft. & Ft.	1	0
12.	Chic. & North-Westn.	Marquette.	xc.	Ft.	1	0
15.	Pennsylvania	Riverside.	rc.	Ft. & Ft.	1	0
†17.	*Southern*	Rudd.	bc.	P. & Ft.	3	37
18.	Pere Marquette	Palms.	xc.	P. & Ft.	2	5
19.	*Chic. & North-West'n.*	Chicago.	xc.	P. & P.	1	20
20.	C., C., C. & St. Louis	New Carlisle.	xc.	P. & Ft.	1	0
21.	Erie	Marion.	bc.	P. & Ft.	1	5
25.	*Erie.*	Leiter's Ford.	rc.	P. & Ft.	1	20
25.	Kalamazoo & Mich.	Langsville.	xc.	Ft. & Ft.	3	2
26.	Texas & Pacific	Baird.	bc.	Ft. & P.	2	0
†27.	*Mo., Kan. & Texas*	Dallas.	bc.	P. & Ft.	3	40

Derailments.

Date.	Road.	Place.	Kind of train.	Cause of derlmt.	No. persons reported Kil'd.	Inj'd.
2.	Long Island	Flushing.	Pass.	washout.	1	0
7.	Northern Pacific	Weston.	Ft.	runaway.	2	3
8.	Phila. & Reading	Arcola.	Pass.	acc. obst.	1	1
8.	Mo., Kan. & Texas	Jolly.	Pass.	loose rail.	0	18
13.	Norfolk & Western	Montvale.	Ft.	b. flange.	1	12
13.	Norfolk & Western	Montvale.	Pass.	acc. obst.		
17.	Atch., Top. & S. Fe	Bengal.	Ft.	washout.	1	0
*17.	Boston & Albany	Everett.	Ft.	unx.	0	0
†18.	Atch., Top. & S. Fe	Earl.	Pass.	b. rail.	3	3
19.	Southern	Savage Creek.	Ft.	cow.	1	6
25.	Chesa. & Ohio	Klondike.	Pass.	spr. rail.	1	0
*26.	Wabash	Thompson.	Pass.	spr. rail.	2	7
26.	Louis. & Nash.	Blockton.	Pass.	unx.	1	4
27.	New York Central	Nehasane.	Pass.	b. truck.	0	1

Other Accidents.

Date.	Road.	Place.	Kind of train.	Cause of derlmt.	No. persons reported Kil'd.	Inj'd.
12.	Central of Georgia	Reynolds.	Ft.	boiler.	3	0
15.	C., C., C. & St. Louis	Fontanet.	Pass.	explosion.	0	3
*19.	Erie.	Crown Point.	Pass.	fire.	0	0

Of the 18 serious accidents to electric cars noticed in the newspapers in October, eight were reported as having been attended with fatal results. In one case, a butting collision in the city of Chattanooga, four persons were reported killed. The other seven fatal cases were in Steubenville, Ohio; Rapid City, S. Dak.; Cincinnati, Ohio (2); Worcester, Mass.; Cuyahoga Falls, Ohio, and Chicago, Ill.

We have received the return of the total number of persons injured by the third rail in England from 1904 to 1907. The return undoubtedly shows that as people become more accustomed to the third rail, the number of accidents tends to decrease and this in spite of the steady increase in the electrified mileage. While in 1904 there were 28 accidents, eight of which were fatal, during the first eight months of the present year there were only 14 accidents, two of which were fatal, and even this small number of accidents was largely made up of trespassers. The grand total, 1904-07, is 16 killed and 71 injured, but out of this number 12 of the fatal accidents and 25 of the injuries were to trespassers. On the whole, in view of the increase of third-rail mileage which has taken place, more especially in the London district, the number of accidents from this source seems small. It is very doubtful if the record would have been any better with overhead conductors.

NEW PUBLICATIONS.

Railway Enterprise in China. By Percy H. Kent. 304 pages; 5½ x 9 in.; with maps. Published by Edward Arnold, London, 1907; agents for the United States, Longmans, Green & Co., New York. Price, $3.50.

The transportation system of the Far East, and especially of China, has recently been discussed by a number of authors and has been made the subject of magazine articles and consular reports, but we have seen no other reference book which goes into the subject in as full and orderly a manner as the book at hand. The author divides the history of railroad enterprise in China, covering a period of rather more than 40 years, into three stages, the first being that of foreign attempts to persuade the Chinese to allow the introduction of railroads, between 1863 and 1878. The next development was a progressive movement emanating from the Chinese themselves (1879 until the outbreak of the Chinese-Japanese war in 1894), while lastly comes the era of concessions in which the dominant feature is foreign control, this period extending from 1894 to the present time. The author comments that a history of this sort reflects the main characteristic of the Chinese official classes and the tendency of the Far Eastern policy of foreign powers, and says wisely that it is not best to prophesy of the future, but that it may be remarked that the tendency at the moment is towards the elimination of foreign control.

The enthusiastic promoter of railroad enterprises in far lands and the prospective investor to whom the promoter talks, should both of them read this book, because it shows with picturesque clearness some of the kinds of trouble that can be gotten into by well-intentioned business men in the Orient. Those who sought to build railroads in China in early days found that Chinese official relations with foreigners were characterized with deep-seated and bitter prejudice and hostility, a feeling which reflected long years of unjust usage of the Chinese people by foreign nations with which they came in contact, as well as it did the natural disposition of the people. On the other hand, Chinese merchants, always characterized by a strong utilitarian sense, had only to be convinced of individual benefit to adopt the means that conduced to so desirable an end; therefore railroad builders had support on the one hand and constant discouragements on the other. Many queer things happened to concessions, both before granting and after, but apart from this preliminary and fundamental difficulty, petty annoyances which often assumed first-class magnitude sprang up on all sides. For example, in a land of ancestor worshippers you cannot build a line through or over a graveyard. As it is customary in China for most families to have their own graveyard, this becomes at once a serious obstacle, which will only occasionally yield to the influence of silver.

In 1876, a few weeks after the first completed part of the line between Shanghai and Woosung was opened, another source of trouble arose. A native, who committed suicide by throwing himself in front of a train, started a state of hostility so great that the viceroy ultimately ordered the line demolished and the rails and rolling stock dumped on the beach of the island of Formosa, while a temple to the Queen of Heaven was erected on the site of the Shanghai station.

An entirely different difficulty against which early builders of railroads in China had to struggle was that of receiving too much assistance from local authorities. In 1887, prior to the conclusion of the Japanese treaty with regard to Formosa, the governor of the neighboring province in which Formosa was at that time included, decided to build a railroad connecting the capital with the sea. It was necessary, of course, to employ foreign engineers, and the Chinese governor found that one of his hardest tasks was to reconcile this with the anti-foreign feeling prevalent at the time. The governor, therefore, decided to superintend the survey of the first few miles himself, and cheerfully laid out a route so widely at variance with the recognized principles of railroad building that his railroad either washed away or filled up with mud after every rain. Moreover, the Chinese soldiers employed on the necessary earthworks were only answerable to their own officers, and persistently ignored the instructions of the engineers. As might have been expected, most of the railroad built in this way had to be built over again, and the work took a long time.

But from first to last there were always some wise ones in the government councils who saw the need of railroads, so that railroads were gradually built and extended. From localized con-

tests between individual railroad builders and individual viceroys, the diplomacy of communications shfited to a contest between foreign nations to obtain concessions, and the objections to the fundamental idea of a railroad gradually faded away. The author shows that there are at the present time 3,539 miles of railroad in operation in China, of which Russian capital has built 1,596 miles (the Chinese Eastern Railroad); Belgian capital 760 miles (the Peking-Hankow Railroad); Chinese and British capital together have built 588 miles (Imperial Railroads of North China); German capital has built 280 miles; Chinese capital working alone has built 143 miles; British capital working alone has built 95 miles; Japanese capital has built 48 miles, and American capital, 30 miles. There are also 1,285 miles of road now being built, and the French are interested in a greater amount of this new mileage than any other nation, with Great Britain second and native capital third. An additional mileage of 4,174 miles has been projected and sanctioned by the Chinese government, something like half of the whole amount to be built by Chinese capital and the rest to be divided between German, British, French, Belgian and Japanese capital. Including railroads which have been built and those now building in China (1907), and comparing returns with Japan, India and the Russian Empire (1904), it appears that China and Manchuria have almost 369 square miles to every mile of railroad, as against not quite 221 in the Russian Empire, 40⅓ in India and 38⅓ in Japan, while the population to one mile of railroad amounts to 77,114 in China and Manchuria, 10,446 in Japan, 8,603 in India and 3,379 in Russia.

At the present time, with the apparent exception of the German line in Shantung, there is not one line built or authorized in China of which the government has not secured the right to assume at some time or other the sole control; therefore it may be said that a state system of railroads has been evolved, and that, so far as can be seen, the Chinese policy of the day is to follow in the same path. But as the author points out, these things cannot be considered in the light of adherence to a well-planned policy, but rather as the designedly chosen form of the expression of the native dislike to foreign enterprise.

The three principal economic questions that now present themselves in China are: (1) How far will the policy of foreign powers interfere with the future development of this state system; (2) is a system of state railroads the most desirable for China, and (3) assuming such a system to be the most desirable, on what lines can it be most usefully developed? The author believes that, at least for the present, the development by the Chinese of their own system of railroads on their own particular lines is not likely to be interfered with by the territorial aggressions of foreign powers. He believes also that government ownership is preferable to private ownership in China on account of the peculiar conditions which obtain there. As regards future development, the Chinese are determined at all hazards to preserve their sovereignty in railroad matters, and yet the railroad question of the future must be primarily a financial one; since the Chinese investor is a negligible quantity, foreign money will inevitably be required. It is incumbent on the Chinese government, therefore, to provide sufficient guarantees to the investing public to tempt this foreign capital to come. The great difficulty arises from the fact that China has not a strong central government really capable of controlling the powerful viceroys throughout the empire. The author believes that the policy of the future should be to weld the existing railroads as far as possible into one uniform system under a central authority, but he is not sure that China has the will to face the situation and give up or alter the policy of seclusion that has been its fundamental characteristic since the memory of man.

Deformations of Railroad Tracks and the Means of Remedying Them. By G. Cuenot, Chief Engineer Bridges and Highways, Paris, Lyons & Mediterranean Railroad. Translated by W. C. Cushing, Chief Engineer of Maintenance of Way, Pennsylvania Lines West. 6 in. x 9 in.; 150 pp.; 50 drawings. Price, $2.00. The *Railroad Gazette*, New York, Chicago and London.

The author sets his pace in these words: "The time seems to have come, therefore, for making a minute study of the track, to ascertain what forces it is subject to, and how it can be made stronger." His study is minute and covers five years of accumulation of facts, including accurate observations, with cunningly contrived instruments of precision, of rail and tie movements and bending.

The results of his experiments to determine the economic length of ties are particularly interesting. Under both a stationary and moving load he finds that "the most advisable length for a tie for diminishing its flexure ought to be in the neighborhood of 7 ft. 2½ in." With longer and shorter ties there is a greater deformation of the ballast. He goes farther than this:

"Therefore it is impossible to diminish the sinking of ties by increasing their length; moreover, independent of its uselessness, this elongation produces a grave disadvantage, for it increases the bending. It is not by this means that we should seek to reduce the deformation of track, but by widening the crosstie, by concentrating the material about the points of support, and, above all, by increasing its moment of inertia."

The engineer should carefully study the experiments leading to this highly important conclusion, which largely affects the amount of first cost and maintenance of ties. He makes both service and instrumental observation tests of wooden, metallic and composite ties, with a resultant strong leaning towards a composite tie, in the form of an inverted channel, slightly widened at the base, with a wood filler, 27½ in. long, under each rail. In detail this seems to be an economical design, six times as rigid and in all observed ways more effective than wooden or all metal ties. The short length and position of the wood fillers make an automatic guide to tamping only in the proper place under the rail. It would be difficult to tamp this tie so as to make it "center bound," and, also, the design prevents lateral movement.

The observations on the creeping of track and resultant effects on gage are minute and interesting and some of them are new.

The value of the book lies in its success in developing, by painstaking empirical methods, a true science in track work. It is quite in line with several present undertakings in this country to find and record the stresses on track, such as George L. Fowler's "Pressure of locomotive wheels against rails," in the *Railroad Gazette* September 20; and the elaborate experiments now being made by the Pennsylvania, on the West Jersey & Seashore division, to determine the actual and comparative blows delivered by electric and steam locomotives; and the experiments for a like purpose now being made at Schenectady by Mr. Fowler for the New York Central.

Two things are evident: We are wasting money in the attempt to make track strong enough to meet the new kinds of traffic, and, we are running great risks in using electric motors for heavy service and high speed without knowing more precisely their effect on track. As a basis for study, no engineer can afford to ignore the experiments detailed in Mr. Cuenot's book.

The Way to Ship from Chicago to the South.

The Freight Traffic Committee of the Chicago Association of Commerce has issued a 69-page pamphlet of shipping instructions, which it describes as intended for the protection and acquisition of Chicago's freight in the Southeast. The committee believes that every package of goods for the Southeast shipped by routes listed in this guide will be delivered with the greatest safety and despatch possible under present conditions and arrangements and received with satisfaction to the consignee and increasing prestige to Chicago. Every road serving southeastern territory from Chicago is now operating a system of through package cars, each car performing a particular service which cannot be duplicated. Every shipper shipping by these routes at once profits by one of the important constructive acts of the Chicago Commission of Commerce, acting through its Freight Traffic Committee to promote the efficiency of through car service. In the routes given, every effort has been made to use to the fullest extent the through package car service, thereby placing the shipment as near its final destination in through cars as is possible, so that transferring at a large number of points is avoided. Every effort has been made to route shipments into joint transfer stations, thus avoiding delays caused by team or switching transfers.

The plan followed is to give an index number to each of the 12 main routes to the Southeast from Chicago and to each of 22 connecting routes, and an index letter to each of 33 junction points involved. The succeeding pages in the pamphlet are devoted to a list of each railroad station in the states of Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee and Virginia, and each station has after its name the index numbers and letter which determine the route. Thus: Biltmore, N. C., is indexed 2-B, which indicates that the route is by the Monon, via Asheville; West Point, Miss., is indexed 6-M-55, indicating that the proper route is over the Wabash and the Mobile & Ohio, via East St. Louis.

The pamphlet puts at the service of every shipper advice which is usually confined to houses having a well organized traffic department and is a very convenient and valuable publication. The Association is now working up the Southwest and ultimately expects to work up the northwestern territory in the same manner. It has spent nearly a year in working up the territory covered by the guide at hand.

CONTRIBUTIONS

Walschaert Valve Gear.

Boston, Mass., Nov. 13, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice in various accounts of locomotives that the name of the valve gear that is now being put on so frequently is spelled "Walschaerts." This I believe to be erroneous, and that the final "s" should be omitted. The error appears in so many accounts that I am afraid it will mislead people and cause them to believe that the "s" belongs there.

F. W. DEAN.

Tank Locomotive for the Midland Railway.

A large tank locomotive has recently been built at the Derby shops of the Midland Railway, which is intended for long distance running in a service somewhat similar to that performed by the suburban class of locomotives used in the United States. The cylinders are inside-connected and the engine is intended for working in either direction after the manner of the Forney engines, to which class it belongs. The wheel arrangement is 0-6-4, which in itself marks a departure from previous Midland Railway standards, and apart from this the engine is considerably in advance, both in size and power, of the largest tank locomotives hitherto used on this line. In designing the new engines, R. M. Deeley, M. Inst. C. E., Locomotive Engineer of the Midland Railway, has kept in view the inevitable requirements of traffic in the future at the present rate of expansion, and he has provided a locomotive which is capable both of exerting a high tractive power and of running reasonably long distances without having to stop to replenish the water and coal supplies.

The cylinder and boiler volumes are large for a tank engine, and by the use of six-coupled wheels distributed favorably for weight carrying, the adhesion force is well calculated to be in ratio with the tractive effort. The substitution of a four-wheel truck for the more common single radial axle under the bunker permits of an ample coal carrying capacity without undue heaping, the latter being a highly objectionable if not dangerous practice in engines which run as frequently bunker first as the other way about.

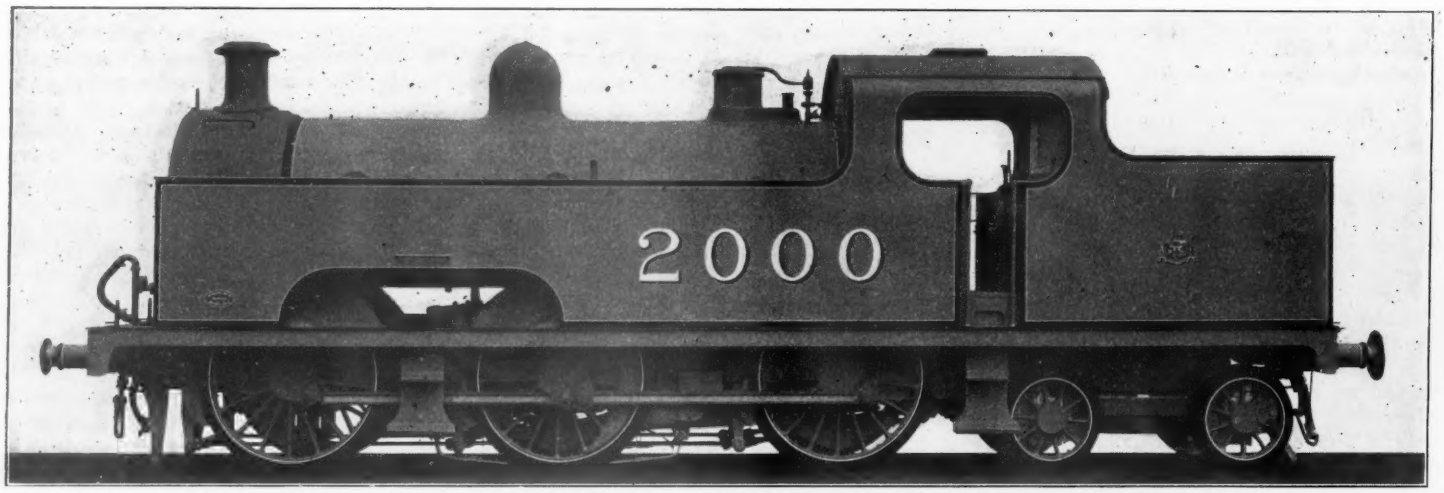
The customary practice, in radial or other tank locomotives with shorter bunkers, is to pile the coal up almost to a level with the cab roof, with the result that the engineman, when the locomotive is running cab in front, is obliged to lean over the side to obtain a view of the line ahead. With the longer and lower coal bunker, certainly does not accord with the idea of the fitness of things. The reason for it is to be found in the occupation of the whole space between the frames by the cylinders and the crowding of the crank pins in toward the center of the engine and beyond the cylinder centers by the boxes and the cheek pieces of the axles. The virtual offset in the connecting rods that is thus occasioned is about ½ in.

The equipment includes automatic vacuum and steam brake, also hand brake, and carriage warming apparatus.

Steam sanding gear is fitted, sand being delivered under the tread of the driving wheels on both sides. Lubrication is effectively performed by sight-feed lubricators to each axle-box, sight-feed displacement to the cylinders, and special suction lubricators for the slide valves.

Below we give the leading dimensions:

Cylinders, diameter	18½ in.
Cylinders, stroke	26 in.
Cylinders, stroke	26 "
Coupled wheels, diameter	5 ft. 7 "
Bogie, diameter	3 " 1 "
Boiler, barrel, length	4 " 9⅛ "
" barrel, length	10 " 5 15/16 "
" length between tube plates	10 " 10⅝ "
Tubes (copper) number	242
Tubes External diameter	1¾ in.
Tubes, length	10 ft. 10⅝ "
Fire-box shell, length	7 ft.
Firebox shell, width at bottom	4 ft. ½ in.
Heating surface, firebox	125 sq. ft.
" " tubes	1,206 "
" " total	1,331 "
Grate area	21.1 "
Working steam pressure	175 lbs.
Weight on drivers	117,960 lbs.
Weight, total	162,200 "
Wheel base, rigid	16 ft. 6 in.
Wheel base, total	29 " 0 "
Total length over buffers	40 " 4½ "
Tank capacity, water	2,250 gals.
Coal capacity	3½ tons.
Tractive effort	19,756 lbs.



Six-Coupled Tank Locomotive for the Midland Railway.

unprovided with railings, of the present case it should be at all times possible to look ahead through the end windows.

The engines are fitted with water pick-up apparatus adapted for operation in either direction. The scoops let down between the rear coupled and forward bogie wheels, the apparatus being manipulated by hand gear, while a flap valve closes the mouth that is not in use. The water is taken up through a Y pipe to the hind tank and it passes thence into the two side tanks through other pipes having equilibrium connections.

The boiler is of the Midland standard pattern with semi-circular fire-box shell, the barrel portions being built in two rings with a telescopic joint just in front of the steam dome.

The engine main frames are of steel plate 1 in. in thickness. The valve motion is of the Stephenson link pattern actuating balanced slide valves which work between and at the sides of the cylinders, the latter being bolted to the insides of the frames. Special attention has been given to rendering the movement of the engine around curves easy. The small ends of the connecting rods are fitted with a ball and socket arrangement, and the side rods are provided with ball and socket bushes at the pin joint connection in front of the driving wheel crank pin. The leading axle has the Cartazzie axle boxes in a modified form, allowing of 1¼ in. side play. The bogie at the trailing end has a total side play of 5½ in., and by the combined means adopted for imparting to the engine a readiness to take curves it will be possible to pass around curves of four chains radius with ease.

There is one feature of this engine that is a decided novelty. The centers of the crank pins are not in line with the centers of the cylinders and piston rods. It is doubtful if this has ever been done intentionally before. It may have occurred through a mistake of the designer or in the shop, but to do it with deliberate intention

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 5.97$$

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 8.21$$

$$\frac{\text{Tractive effort x diameter of drivers}}{\text{Heating surface}} = 986.96$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 53.60$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 11.05^*$$

$$\frac{\text{Weight on drivers}}{\text{Total heating surface}} = 104.29$$

$$\frac{\text{Total weight}}{\text{Total heating surface}} = 121.86$$

Volume, 2 cylinders = 8.09 cu. ft.

$$\frac{\text{Total heating surface}}{\text{Volume 2 cylinders}} = 164.52$$

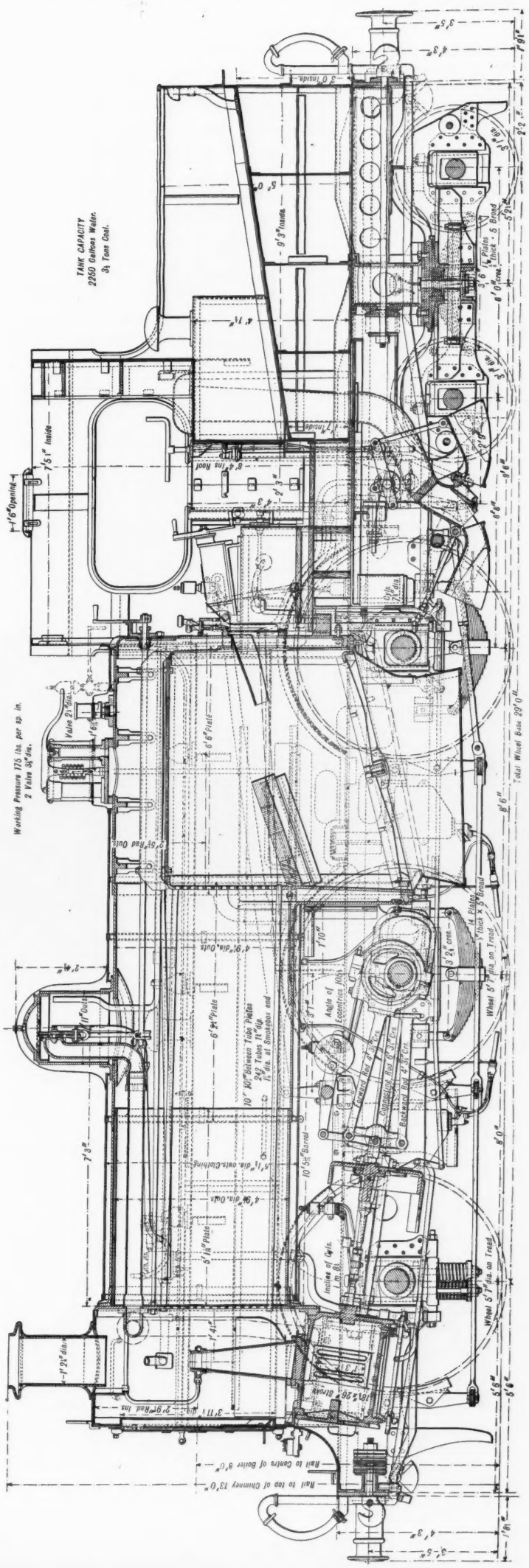
$$\frac{\text{Grate area}}{\text{Volume 2 cylinders}} = 2.60$$

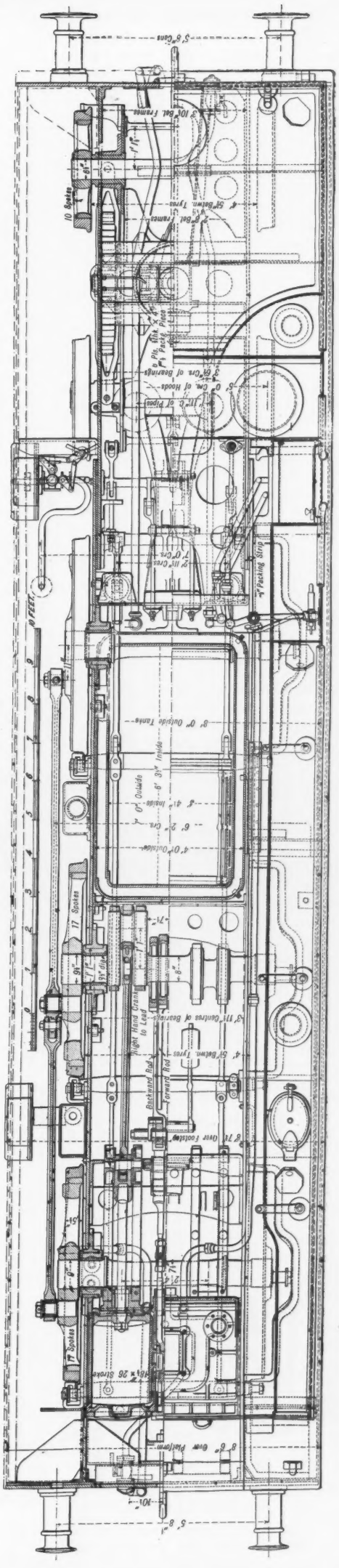
Tube heating surface equated to firebox heating surface (Vaughan formula) sq. ft. = 368.48

Total equated firebox heating surface = 493.48

$$\frac{\text{Total heating surface}}{\text{Total equated firebox heating surface}} = 2.69$$

*Per cent.

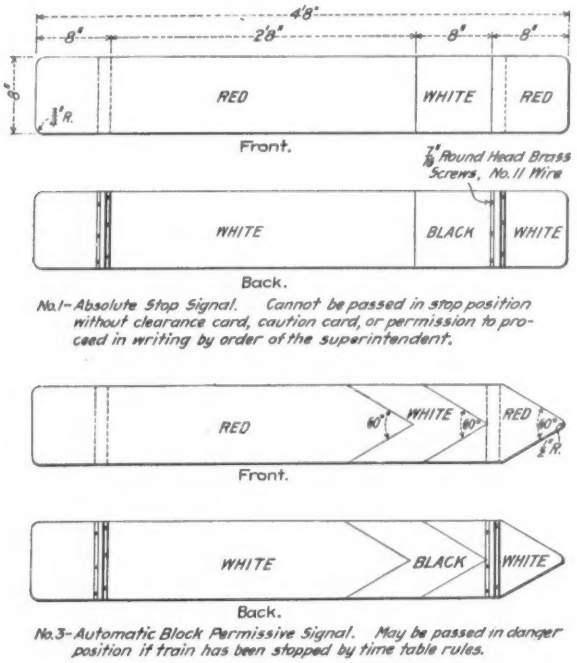

TANK CAPACITY
2250 Gallons Water.
3½ Tons Coal.
Working Pressure 175 lbs. per sq. in.
2 Valve 21" dia.
2 Valve 9" dia.
Valve 21" dia.
6' 6" Plate
6' 3" Inside
6' 4" Ins. Roof
7' 1" Inside
1' 6" Opening
Rail to Centre of Boiler 9' 0"
Rail to top of Chimney 13' 0"
Total Wheel Base 29' 0"
Wheel 5' 7" dia. on Tread
Wheel 5' 1" dia. on Tread
Angle of Eccentrics 105°
Inside of Cyls. 1 in. Bl.
10" Stroke
10" Barrel
Between Tube Plates
242 Tubes 1¾" dia. at Smokebox end
Compensating Link 8' 3" Centres
Forward Rod 4' 10" Centres
Backward Rod 4' 10" Centres
Between Frames
Between Buffers



Plan and Elevation of Tank Locomotive for the Midland Railway.

New Haven Suspended Signals.

The semaphore blades shown herewith, Fig. 1, are those recently adopted as standard by the New York, New Haven & Hartford, of which C. H. Morrison is Signal Engineer. The different forms, Nos. 1, 2, 3, 4 and 5, are described on the drawing. The principal difference between these standards and the standards approved by the Railway Signal Association is the addition of the round-end stop-signal blade, which is designed for home signals at interlockings and other places where it is desired to allow trains (when necessary) to pass a signal in the stop position by the use of a hand signal. The permissive signal blade, No. 3, can be used not only on automatic signals, but also, in special cases at the approach to a facing-point switch. It is proposed to use No. 4, not only as a distant signal, but also at any place where it is desired to control the speed of trains.



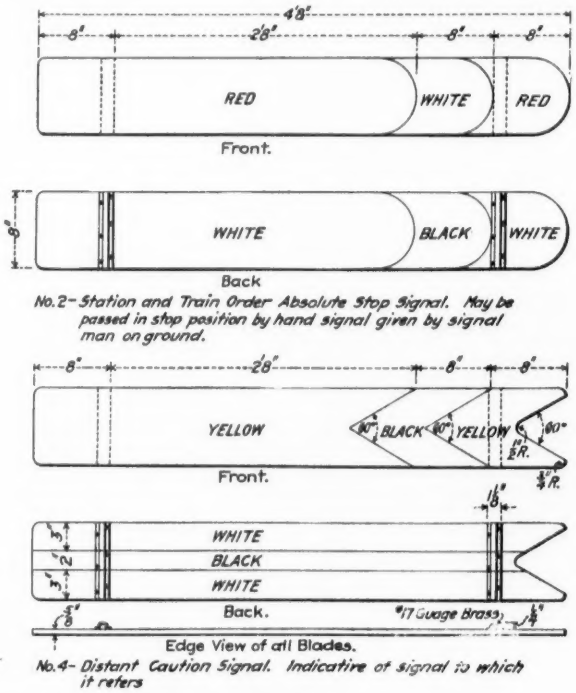


Fig. 1—Standard Signal Blades; New York, New Haven & Hartford.

Blades made by these standards are now in use. Square-end blades are used at drawbridges, as no train is allowed to pass such a signal when in the stop position without a written order. At interlockings where, in case a signal is deranged, engines are allowed to pass on receiving a hand signal, the round end blade will be used.

The blades shown in Fig 1 are designed for suspended signals like those shown in Fig. 2. These are used on the electrified lines between Stamford and Woodlawn, where bridges span the main tracks every 300 ft.; but the designs of blades are standard throughout the whole of the company's lines, except in regard to the details of fastening to the spectacle casting. The standard dwarf (not shown) has a round-end blade. A number of suspended signals are already in use and are said to give entire satisfaction. Although in this arrangement the benefit of a sky background is often sacrificed, the system has the advantage of a uniform height for all signals and the signals can be better seen under highway bridges. As indicated in Fig. 1, the stop signals are always painted red, and the distant signals yellow. The vertical member of the suspended signals, which takes the place of the post, is painted black, the same as the rest of the bridge.

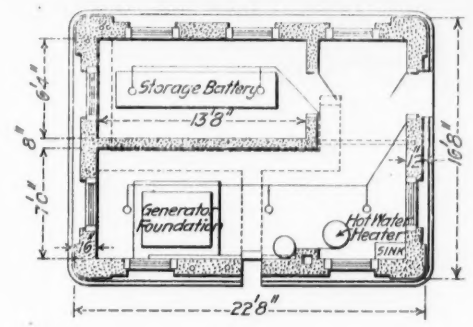
Fig. 2—Suspended Semaphore Signals; New York, New Haven & Hartford.

The Austrian State Railroads, which bought its lines of the state at a time when the latter had to have money and had no credit, is accused of letting its property fall greatly out of order in anticipation of its re-acquisition by the state, which has been decided upon, though the time for it is not yet fixed. Among other things cited in evidence of its inadequacy to meet present requirements is the fact that 5,700 of its freight cars, more than half the whole number, are more than 40 years old, while it runs 23 passenger cars built before 1849, 136 built before 1857, and 330 built before 1872.

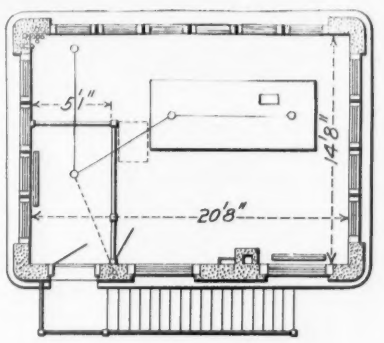
Concrete Interlocking Tower on the New Haven.

The New York, New Haven & Hartford has recently installed a new all-electric interlocking plant at Naugatuck Junction on the New York division, and the machine, storage batteries and charging generator are housed in a concrete tower. The tower is 22 ft. 8 in. by 16 ft. 8 in., two stories high, of plain concrete with concrete arch floors supported on I-beams. On the ground floor are the generator

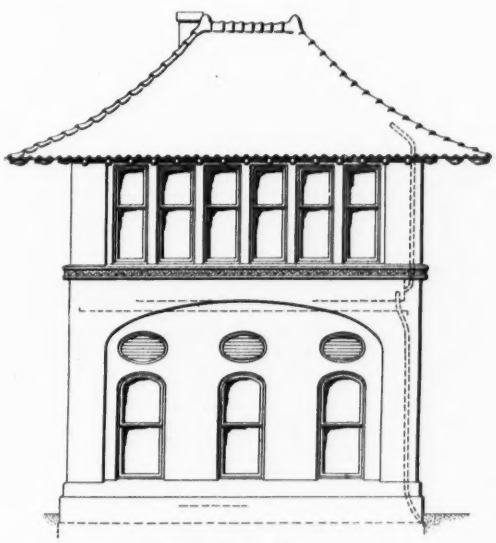
Concrete Interlocking Tower at Naugatuck Junction.



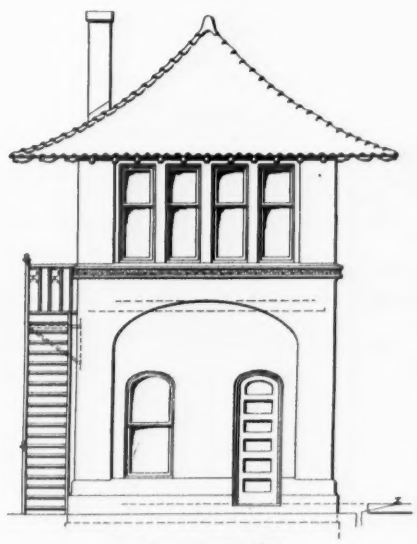
First Floor Plan.



Second Floor Plan.



Front Elevation.



End Elevation.

Concrete Interlocking Tower at Naugatuck Junction; New York New Haven & Hartford.

set, storage battery room, heater and lavatory. The battery room is 13 ft. 8 in. by 6 ft. 4 in., and is partitioned off by an 8-in. concrete wall extending from the floor to the ceiling. The batteries are mounted on shelving in the center of the room, so that they may be examined from all sides. There are two large windows on the side, and at the end so that good light is obtained to look through the battery jars. The main battery for the interlocking plant consists of 55 cells, of 120 ampere-hours capacity, delivering 119-volt current to the switch and signal motors. In addition there are two sets of 6-cell, 80-ampere-hour capacity batteries for operating the lock and block instruments. The generator set is a Fairbanks-Morse 6-h.-p. direct-connected gasolene engine and dynamo mounted on a concrete foundation.

In the second story is mounted the 47-lever Union all-electric interlocking machine, which occupies a space 10 ft. 9 in. by 4 ft. 6 in. The track side and both ends of the tower are practically solid glass and there are two large windows in the rear. Entrance to the second floor is by an ornamental iron stairway on the outside of the building at the rear.

Electric Railway and Public Service Legislation.*

BY HENRY J. PIERCE,
President of the International Traction Co., Buffalo.

It would be well for the country, for the welfare of its financial institutions, for its business prosperity, for the stability of the investments of people both rich and poor if, when those high in authority speak, they should not judge all corporations by the few who have done wrong, but also should bear in mind that the great majority of corporations are conducting their affairs honestly and in the interests of the people whom they serve.

During the Old Home Week celebration in Buffalo a few weeks ago, the greatest curiosity was a street car drawn by horses, yet it was an exact reproduction of the mode of transportation furnished only so short time ago as 1891. The very car had been pulled through the streets at that time by the horses which hauled it in 1907. The driver and conductor had performed similar service in horse-car days. The straw was on the floor to keep the feet warm. The four oil lamps were in their places. It seemed the product of a thousand years ago compared with the 30-ton electric cars between which it was sandwiched—vehicles lighted with half an hundred electric lamps, heated by electricity, and which it would have taken the power of 100 horses to propel at speed.

In 1891 the horse-car plant was sold for scrape and replaced by electricity. By 1896 increase in travel made it necessary to practically rebuild the entire system, requiring the installation of heavier rail, larger cars, up-to-date machinery, and within the past three years many electric railway systems have again, for similar reasons, been practically rebuilt. These expenditures could not be paid for out of earnings, and had to be provided for by new issue of bonds and stock. Thus while many electric railways could be replaced for less than their capitalization, yet the excess is accounted for largely in many cases by the cost of rebuilding to meet new conditions.

The dual duty of a public utility corporation is to provide good service to the people from whom its franchise was obtained, and to return to its stockholders a reasonable profit on their investment. The electric street railway may not increase its fare, yet wages have increased, and the cost of material has advanced over 40 per cent. in three years. The public are ever expecting greater facilities, which require heavier track, larger cars, increased power, more car-houses, more efficient and therefore higher-priced trainmen, better and more frequent renewal of pavements, extension of tracks into sparsely settled neighborhoods, while the state and municipalities are constantly increasing taxation.

Under the combination of circumstances one of four things must inevitably occur:

First.—Poor service.

Second.—Price of labor and material reduced.

Third.—Rate of fare increased.

Fourth.—Taxation reduced.

The manufacturer or the private corporation may close their plant for a time when business is not profitable, or need not maintain their plant at a high state of efficiency; but the public service corporation is always in the public eye—it must keep on, it must keep up the quality of its service to highest standard. The business of an electric railway in fast growing communities is increasing to be sure, but not nearly in the ratio of increase of expense of operation, maintenance and necessary betterments. Of course poorer service cannot be permitted under any circumstances; in fact it

*From an address at Madison Square Garden, New York City, Oct. 1, 1907.

should be constantly improved. A proposal to increase the rate of fare is not practical.

Real estate may be developed and a building left for years without improvement, addition or even a coat of paint on its woodwork. Not so with a street railway. The public, not unnaturally, insists on the newest type of cars, on more cars, on better and still better service, on greater comfort, on perfect hygienic conditions. An unpainted or old-time battered car would no more dare to run on a modern city street railway system than a caravel of Columbus would dare venture to cross the bows of the "Lusitania" in defiance of the new queen of the seven seas. In Buffalo there are buildings on the foremost streets which are three and four and even five and more times as old as the oldest type of street cars in the entire system. And Buffalo is no eyesore in this respect—not at all. The same is true in other cities. The public is more exacting with street railroads than with any other form of business.

Public officials reflect the attitude of the public in this regard. Municipalities yearly require more and more from street railways. Repaving, re-tracking and new paving, new tracks, new cars, care of street and other items, constantly increasing in number, heavily swell the total of expenditures. Added thereto are taxes; and all these requirements causing increased expenditures to the street railway are in turn used as a basis for increase in taxes. Here we find the one feasible and valid method of relieving the existing situation. The municipality or state can lighten the burden. In view of the heavy expenditure yearly required and the tremendous cost of operation and maintenance, resulting in greater conveniences and facilities to the public and materially benefiting the municipality as a whole as well as each individual citizen thereof, this added load of taxes could or should be greatly lessened or removed. The street railway then could better fulfill the public demand and could turn to its owners for authority for further improvements, at the same time permitting a reasonable income on genuine investment.

When the Public Service Commission Act was in process of passage, I opposed it for two fundamental reasons—the bestowal of such vast powers for the regulation of the business affairs of corporate citizens, and because it denied the foundation principle of our Republic that every citizen should have the unrestricted right of appeal to the courts. But the Public Service Commission Act has now become a law, and while if in the hands of unjust or arbitrary commissioners it would bring hardship and perhaps ruin upon the corporations affected, yet the wise choice of commissioners by Governor Hughes insures that while the interests of the people will be looked after, yet that corporations, which are citizens of the state, will undoubtedly be treated fairly, and no unjust demand be made upon them. I am confident that in requiring that betterments and changes be made in the plants of the corporations over which they have supervision, the commission will take into consideration the almost impossibility of raising money at this time, a condition largely brought about by unwise, cruel and sometimes unwarranted attacks made upon public utility corporations.

The majority of street railways are no more overcapitalized than real estate is overcapitalized. I believe every fair and informed student of conditions will corroborate this. Whether it be a trolley line or a 10 or 20-story building, the method and proportionate extent of capitalization are the same. But there the similarity ceases, for after capitalization the building goes its way serenely, the initial cost being the final cost as well; but the street railroad through the long period of construction encounters difficulties on every hand, not only labor but questions of consents and adjustments, and through each succeeding year the demands in service and maintenance and operation increase and multiply.

Capital requires and is entitled to a fair return on investment. It is estimated that fully 80 per cent. of the street railways of the United States are not paying dividends. Capital invested in street railways finds the electric railway situation of to-day a problem requiring the most serious consideration. Any who would blindly heap further burdens of expense on the electric railways of the country, either know little of or care less for the best interests of the people at large.

This is no calamity cry. I have endeavored briefly to outline conditions as we who are in the street railway business know them to be. I believe that to-day, considered from the business standpoint as between the electric railways and the "value received" which they give to the people in return for their fare, in most communities the people have the best of it; that the electric railways that are in need of the most help from their father (the state), their mother (the municipality); that they require the "first aid for the injured" from their doctors (the Public Service Commission) to keep them out of the ravenous clutches of their uncle, the money lender. The electric railway cannot sell its bonds, and the only money it can secure is what it can beg from its stockholders, borrow from the banks, or coax from its conductors.

Trolley lines are no experiment in the upbuilding of the country. They are welcomed and sought. Where they are wanted to-day, they should be built not later than to-morrow. The future years should hold in their history a wondrous record for electric railways—a record dependent on fair and liberal treatment of one of the foremost utilities of the world.

Suppose at this moment that every electric railway in the state were to be blotted out of existence—not a return entirely to primitive conditions, but simply so far as street railroads and trolley lines are concerned. A glance at a map will show what disaster would be wrought—not with a view to invested capital, but to communities. The mere loss of power and stopping of cars for an evening hour throws a whole city into confusion, inconveniences thousands of people and causes complete rearrangement of countless plans. The withdrawal of suburban and interurban trolley service would well nigh isolate whole sections of the state. Electric railways not only are essential to the development and prosperity of the state, but they are an institution, a utility in closer constant contact with the people than any other form of services known to society.

The electric railway situation of to-day, summed up, shows existing systems beset by tremendous expenses, which make relief from heavy burdens of taxation imperative. It shows the great need for extension of electric railways, with capital hesitant to enter where the risks are so numerous and the financial burdens so heavy, and the dividends return on the investment practically nothing. It shows the whole nation eager for the closer communication of localities. Where trolleys were fought bitterly a decade ago, the opening of new lines to-day is the occasion for a holiday and celebration, with congratulatory speeches, blowing of whistles, ringing of bells, music and cheers of welcome.

It is well for the community; it is well for the passenger; it is well for the employee. In all fairness, should it not be made well also for the man whose money makes all this possible? Is he also not entitled to a fair return on his investment—a fair return, a moderate dividend? I tell you, gentlemen, the government of a state or city or town can far better afford to throw off the burdens of taxation in such an instance as this of an electric railway. In the country the farmer is allowed to work out his road tax, and why not let the street railway perform its full duty to the state and municipality through furnishing every reasonable facility for the comfortable, rapid transit of all the people, instead of compelling it to cripple its resources by paying money into the public treasury for the benefit of other taxpayers who do not represent one-tenth of those who daily utilize the street cars, and whose constant comfort would be thus vastly improved?

We can picture the future day—the day of accomplished deeds, the day of satisfied needs—when that which waited to be done waits no longer. Between now and then lies an era of tremendous endeavor, of ceaseless labor—and through it all we will have no time for needless turmoil, we want no senseless strife. We do want earnest, honest co-operation, not alone with the private investor, but also with the public official—and the day of complete success will come when the investor, builder, operator and official, all four act in a harmony and unison, based on a common confidence that all are working together for the common good.

Individual Car Owners' Association.

Mr. C. O. Johnson, President of this Association, writes that the meeting called to be held at Cleveland was not a failure, as reported. At the first meeting, held in Cleveland last summer, the attendance represented about 25,000 private cars of all lines of trade. At Chicago in September a constitution and by-laws were adopted and a temporary organization was formed. It was deemed best to give ample opportunity to all new members to have a voice in the election of permanent officers, and for that reason the election of permanent officers was deferred until November. At Chicago last week permanent officers were elected, as follows:

President, C. O. Johnson, H. J. Heinz Company, Pittsburg.
First Vice-President, Geo. Osius, Michigan Ammonia Works, Detroit.
Second Vice-President, W. E. MacEwen, National Refining Co., Cleveland.
Third Vice-President and Secretary, R. J. Bailey, Monongahela River Consolidated Coal & Coke Co., Pittsburgh, Pa.
Treasurer, A. M. Bell, Fayette Coal Co., Pittsburg.

Executive Committee.

Silas A. Shafer, Assumption Coal Company, Assumption, Ill.
Geo. Osius, Michigan Ammonia Works, Detroit.
Chas. P. Fink, Louisville Cotton Oil Co., Louisville.
R. L. Somerville, Georges Creek Coal & Iron Co., Farmington, W. Va.
H. D. Williams, H. D. Williams Cooperage Co., St. Louis.
Davis Elkins, Elkins Coal & Coke Co., Morgantown, W. Va.
W. E. MacEwen, National Refining Company, Cleveland.

The purpose of the Association is to bring about a uniform, lawful and equitable system for the handling and use of individual cars throughout the United States, and to provide for a just and legal compensation to be paid for the use of individual cars by others than their owners.

The Association was not formed in any spirit of antagonism. It seems desirable that the different conditions applying in different parts of the country on different classes of private cars shall be discussed at called meetings of the private car owners. In dealing with the difficulties experienced, it is hoped to have conferences with railroad officers, discussing all matters from the standpoint of both classes of owners.

Home Route Slip Bill Used by the N. C. & St. L.

On account of the increase in the per diem rate, and to facilitate the prompt home movement of foreign and line cars, the Nashville, Chattanooga and St. Louis began using on August 1 the "home route" slip shown herewith. It is not original with this line, some other roads already having it in use; but information concerning its object and advantages will doubtless be of interest to roads not acquainted with it. Its purpose is to inform all concerned in handling cars the home route, or the point where and road from which such cars were received on the N. C. & St. L., thus reducing all unnecessary delay and facilitating the home movements of cars in accordance with the code of car service rules. In addition, the slip shows all road movements and the date the car arrived at its destination, thus enabling the agent to know at a glance how long the car has been delayed. The original home route and number of days the car is delayed at stations is reported on the daily car report to the superintendent or car distributer, enabling him to make prompt and proper distribution of all foreign road and line cars on his division.

At large terminals unnecessary delays to cars are minimized, since the persons handling the cars have the proper home route, thus facilitating the movement of cars through the terminal. Another objectionable feature obviated by the use of this slip is that of telegraphing for information necessary to dispose of cars, which lightens the burden on the wires.

The instructions governing the use of the slip are as follows:

(1) The agent at point where car is originally received from a connection makes out the home route slip and attaches it to the way-bill or slip-bill that accompanies the car.

(2) Conductors are not allowed to take cars from stations unless accompanied with slip properly made out.

(3) Slip must follow car to destination if on this line, or to junction point where delivered to a connection for final destination, and when car is returned, or ready for return home movement, the original slip will follow car to point where car was originally received.

(4) Conductors moving cars must indorse on the back of this form, train number, from, to, date, and name of conductor handling car.

(5) When car is returned to road from which originally received, agent must show to what road, and date, delivered, and send slip to the office of the superintendent of transportation for future reference.

Form 1640

Nashville, Chattanooga & St. Louis R'y

HOME ROUTE SLIP BILL FOR FOREIGN CARS

Initial..... *Car No*.....

HOME ROUTE

Received from ....

at.....*Date*.....*190*..

Made by ....

INSTRUCTION

Agents at all Junctions where cars are originally received must fill in accurately the above information for each foreign road, or line car received from connections.

Conductors must not take cars from stations unless accompanied with slips properly made out.

When handling cars from stations where there is no agent, conductors must deliver to or receive from the agent who makes billing for such stations a card of this form. When empty foreign cars are handled on running slip, Form 1344, such form must be attached to this card.

Conductors will turn in slips at terminals to be delivered to conductors moving car from terminal to final destination if on this road, if beyond this road slip must follow car to junction point where delivery is made to connection.

Slips must be conveniently filed at junction points or destination until car is returned or ready for return home movement, then to follow car to junction point car was originally received from.

If slip is lost ask Car Accountant for Home Route, and make new slip. Conductors must carefully fill in the movement spaces on the back hereof.

M. J. C. WRENNE,
Superintendent of Transportation.

Home Route Slip Bill; Front.

Conductors' Movements

FROM	TO	TR-IN	DATE	CONDUCTO-	FROM	TO	TRAIN	DATE	CONDUCTOR

The final Junction Agent on the return Home Movement will fill in space below, and promptly mail slip to Superintendent of Transportation, Nashville, Tennessee.

Delivered to——*R.R. at*——*Station*——*190*—

——*Agent.*

Home Route Slip Bill; Back.

An essential feature to the successful use of this slip is the filing system. Agents at large terminals are supplied with cases for filing slips with the double ending numbers of cars, and small terminals and intermediate stations are supplied with cases for filing slips with the single ending numbers of cars. The larger case has 100 pigeon holes, each divided into an upper and lower part. The upper part is for through cars and the lower for local cars. The upper part is 4 in. x 4 in. x 8½ in. deep, and the lower is the same, with the exception of the height, which is 2 in. The pigeon holes of the left-hand half of the case are numbered with the odd numbers and those of the right-hand half bear the even numbers. This case being for the double ending numbers, a slip for a car numbered 14,165, for instance, would be filed in pigeon hole 65.

The smaller case, for small terminals and intermediate stations, has only 10 of the two-part pigeon holes, for filing slips according to the single ending numbers of the cars. The upper row of five holes has the even numbers and the lower ones the odd. The dimensions of the compartments are the same as for the large case.

We are indebted to J. T. Maney, Car Accountant of the N. C. & S. L., for information. He advises that the good results of the scheme have fully met their expectations.

African Railroads.

The total length of all railroads in Africa is 17,500 miles, divided as follows:

Gage.	Gages and mileage of railroads in the possessions of—— England.	France.	Germany.	Portugal.	Italy.	Congo.	Egypt.	Miles, total.
4 ft. 10 in.	120	2,105	.....	...	..	575	575	2,800
3 " 6 "	7,214	.....	93	461	..	2,865	2,865	10,633
3 " 3½"	584	1,407	423	226	71	...	.....	2,790
Various gages, less than 3 ft. 3½ in.	227	.....	689	41	..	...	.....	1,727
	8,145	3,512	1,205	728	71	399	.....	17,500

The costs per mile of finished road are:

	Cost per mile.
1 ft. 10½ in. Gage.	
Otavi R. R. (German West Africa)	$9,780
Swakopmund-Windhoeck (German West Africa)	15,150
Mayumba R. R. (Congo)	26,290
2 ft. 5½ in. Gage.	
Congo R. R.	50,250
2 ft. 6 in. Gage.	
Freetown-Baima (Sierra Leone)	20,490
3 ft. 3½ in. Gage.	
Togo Coast R.R. (West Africa)	9,670
Bingerville-Kong (Ivory Coast)	19,500
Lome, Palime (West Africa)	24,740
Usambara R. R. (Ger. East Africa)	28,600
Dar-es-Salaam-Mrogora (Ger. East Africa)	36,150
Duala-Manengu R. R. (Kamerem)	41,070
Massaua-Asmara (Eritrea)	61,840
3 ft. 6 in. Gage.	
Egyptian private railroads	14,030
Port Herald-Chiromo (State of East Africa)	14,790
Tugela-Somkole (Natal)	35,950
Natal State railroads	80,780
4 ft. 10 in. Gage.	
Egyptian State railroads	51,900
Algerian state railroads	40,200 to 210,260

The Maintenance of Way Painters' Convention.

The Maintenance of Way Master Painters' Association held its fourth annual convention in the Great Northern Hotel, Chicago, November 19 and 20. The association now has 57 members, about one-third of whom were in attendance. Capt. Robt. W. Hunt made the opening address. The President, A. B. Phelps (L. S. & M. S.), was in the chair, and in his address said:

"I doubt if the maintenance of way painting of our railroads is given the thought and attention by the maintenance of way engineers that it should receive. Painting is done primarily for protection, and secondly, which to my mind is of equal importance, for appearance sake. Too often we get the order to "do no painting for looks sake," to paint only such buildings or bridges as are in actual need of it to protect them. Thousands of dollars are spent in some cases in grading and seeding lawns, horticultural display, in landscape gardening and the like for no purpose but appearance sake, while the buildings are left in a shabby and unkept condition. There is nothing, I think, that adds more to the apparent thrifty condition of any railroad than neatly, tastefully painted buildings and structures. And I

believe that this condition is somewhat of a revenue magnet.

"The maintenance of way painting should, I believe, be a separate and distinct department on all roads, accountable to no one below the engineer of maintenance of way, or possibly the general manager, reporting the expense, of course, to the accountant of the engineering department. The best results are not usually obtained when we are placed under the master car and locomotive painter, the superintendent of bridges and buildings, or the master carpenter. There is always a temptation, and sometimes more than a temptation, to make the road painting stand a portion of the expense which should be charged to other parts of the work; besides, the road painting is not always looked after and kept up as it should be when it is made a part of some other department. No matter how small the road may be, even though but one man be required to do it all, it should be given to some one with proper judgment, and allow him to use that judgment at all times, subject, of course, to certain limitations."

The old officers were re-elected for another year. They are: President, A. B. Phelps (L. S. & M. S.); First Vice-President, W. D. French (N. Y., O. & W.); Second Vice-President, M. F. Ebel (C., H. & D.); Secretary and Treasurer, H. J. Schnell (New York). The next meeting will be held in St. Louis, Nov. 17 and 18, 1908.

Extracts from some of the papers are given below.

OBSERVATIONS FROM PRACTICAL BRIDGE PAINTING EXPERIENCE.

By J. R. Shean, Pacific Electric Railway.

The whole future of a bridge depends upon the thoroughness of the cleaning it gets when new, as well as the first coat of paint applied. Most bridges get a coat of linseed oil or red lead at the works. The oil is to be preferred for two reasons, (1) because it is transparent and allows any rust or dirt to be plainly seen and removed, and (2) because the red lead coat usually applied at the bridge works is nothing more than an oil stain, which runs down and forms pools on the flanges and in the corners, and which covers up every sign of rust that may have been left on the iron, which it is so essential to remove at this time. The only way to get these light rust stains entirely out of the pores of the iron is the sand blast. This can get as deep into the iron as the rust can, while steel brushes and scrapers get only the top of the rust, and the real seat of the rust is still left deep in the pores.

As it is seldom that a painter has a sand blast at his disposal, the best known method of painting the bridge to keep the moisture and gases away from the iron should be used and thus retard the action of the rust as much as possible. Nothing will do this as well as the first coat of good solid red lead well brushed on. Red lead will keep the moisture away and will withstand the action of the gases as well as any of the other pigments. This fact was established several years ago when pieces of bridge iron painted with red lead, graphite, white lead, lampblack and mineral red were placed in the Hoosac tunnel for a test. This tunnel is nearly always filled with coal gas. When the pieces were taken out all traces of paint were gone except on the ones painted with red lead and mineral red, the former being the better of the two.

There has always been a prejudice against red lead on account of its liability to run unless brushed out evenly and with much care. This objection can be overcome by mixing the dry red lead with boiled oil and adding about one-fourth white lead and a little dryer. The white lead will serve to hold the red lead in suspension, and will help it to dry as hard as flint.

After the first coat comes the problem of getting a paint for the finishing coats which will not dry so hard. For general results, so far, carbon is far ahead of any other paint base, although the writer has seen mineral red give better satisfaction around the coal mines in Indian Territory. The greatest trouble with rust is encountered on low overhead bridges, where no paint seems to stand. The writer has a belief that the quick destruction of the paint on these bridges is caused by the red hot sparks being driven with such force against the parts overhead that the paint is burned off or pitted so badly that the iron is left bare and at once becomes a prey to the rust, induced by the soot that the smoke deposits on it and which forms an acid of some kind by absorbing the moisture from the air and from the steam that condenses on it. This conclusion is strengthened by the fact that the higher a bridge is over the track the longer it will take for the rust to eat through; also, from the fact that a bridge over double track on a hill will be affected quicker over the track used by the trains going up the hill than over the track on which they run down without using steam at all. A wooden shield shaped like an inverted V, as wide as the track and placed over the center of it so as to take the force of the sparks and smoke and deflect them downward, would do much to prolong the life of these bridges; or a galvanized or corrugated iron shield might be used.

There are two tools which deserve mention for the removal of rust, which the writer uses. One is a short steel bar made of ¾ in. material and sharpened at one end like a cold chisel. This bar is invaluable for getting into the corners of chord boxes, footings, between the ties, and any place where it is impossible to use a hammer. The other is a hammer first used by the Terminal Railroad of St. Louis. It has a cold chisel edge at both ends of the head. One is parallel to the handle, the other at right angles to it. It is exceptionally good for getting around rivets on the flanges, webs, etc., and it is light enough to keep from cutting the metal too much.

The length of time which should elapse between general paintings of a bridge is a matter of location and of the thoroughness of the previous painting. A bridge across the Hudson river at Mechanicsville, N. Y., was given one coat of red lead and two coats of white lead paint colored with chrome yellow, and at the end of nine years was in fair shape. It was gone over and the rust scales knocked off and touched up every three years. The best painted set of bridges on any one road which has come to the writer's notice are on the Oregon Short Line. These bridges get one coat of lampblack every four years and are bright and clean all the time.

Cinders and dirt should not be allowed to collect on the abutment of bridges until the bridge seat is buried in them. The water which soaks through these cinders and dirt forms an acid which no paint can stand, and many a bridge has been practically ruined by the part resting on the abutment being eaten up with rust from this cause.

PAINTING STRUCTURAL STEEL.

By H. Clapham, Louisville & Nashville.

Contracts for structural or bridge iron call for one coat of paint at works before delivery. This paint often contains, beside the specified amount of oil, an equal amount of turpentine or benzine.. It is applied by incompetent workmen working piece-work. There is no cleaning or scraping; the paint is simply slushed on. As soon as the steel is erected, trouble begins. We should receive our steel without the shop coat.

CARE OF BRIDGES AND STRUCTURAL STEEL WORK.

By W. S. Morgan, Pennsylvania Lines.

The only way to get the blue mill scale off is to let the steel stand from six to eight months after erection, then go over it thoroughly with chipping hammers and steel wire brushes, wiping it off with benzine, always allowing plenty of time for this to evaporate. From my experience I find that no matter whether the steel has been covered with paint or oil, this is the only way to get an absolutely clean surface to begin painting upon, and we all know that this is about half the game in this work. We have had bridges sent to us both with and without shop coats. I have found that those sent with shop coats, although we gave them exactly the same care as those without shop coats, seldom last over four years before requiring repainting, while those sent us clean have lasted in a great many instances seven and eight years. On the first coatings I have had better results from red lead than any other pigment, it being the firmest of all paints, although it is necessary to watch the painters pretty closely to see that they brush it out thoroughly.

PAINT STOCK ON THE ROAD.

By H. J. Barkley, Illinois Central.

Many different ways of handling paint supplies have been tried. On some roads it is the custom to ship only enough material from headquarters to do each piece of work. Often some item is forgotten or enough not sent, and the crew must either wait until it arrives or make some change to get through on the estimate of cost. The most satisfactory way is to have a car with the necessary tools and a supply of paint—a paint shop on wheels, with tanks for turpentine, oil and other supplies, and racks for barrels to avoid loss from rough handling of trains.

On roads where standard colors are used for bridges or buildings the paint should be sent to the crews mixed. The mull stone and paint mill have no place in a paint car. They are not only inconvenient and expensive, but impractical. When a batch of color is needed the cars may be switching or the foreman gone, or the light not good, and the color will not be exact. Often new and inexperienced men will not know every condition, and all these difficulties are expensive.

While the material sent out will not always be suitable for every structure, it should be thick enough to allow re-mixing or thinning, as conditions require, either for new or old work, or as the weather conditions demand. Very often colors mixed in a steam heated shop will be too thin to use in the hot summer months, or too thick in the winter. Often it is necessary to change the color for first or second coats or for jobs where smoke, steam or dust are troublesome. These are things which can be overcome easily enough, and at a reasonable expense, if the color is sent out of the proper consistency. The principal thing is to have all structures of a uniform color, and it is next to an impossibility to obtain these results with "batch mixing" in the cars on the job.

It often happens that a crew will run short of a certain color and must either write or wire for supplies, and either the supply

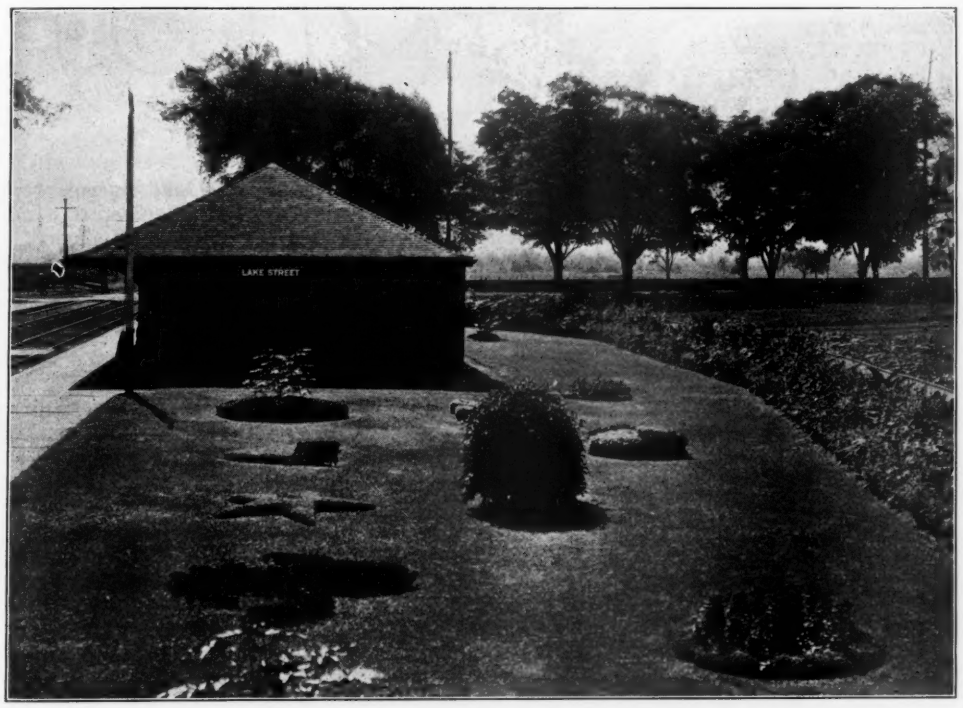
department or the office does not know what is wanted. To prevent this it is best to have all standard colors numbered and a color board in the paint car, at the division offices and in the supply department.

Painters generally are not in favor of supplies coming to them ready to use, arguing that all paints are not suitable for all kinds of work and that the "stir and use" system is not best; but it has been proved that if proper care is taken and the maker and the supply department understand what is wanted, the work can be done cheaper and more satisfactorily. Often those who purchase or mix the paint for use out on the road have not had sufficient experience in this particular line of work, and do not realize how important it is that material should and can be had that will be better suited to the work, all of which will help to lighten the cost and bring better results.

It is the practice on the Illinois Central to carry a stock of material in the cars as nearly suitable for the work as possible, so that a crew could go to any piece of work, as it often happens, on short notice, and be prepared to finish it. Generally speaking, this system has proved satisfactory and has been the means of saving much inconvenience and expense. While there are some objections to this plan, yet it has many advantages over the "batch mixing" and proves that mixed color for road work has come to stay and is the best means of bringing uniform results at a minimum cost.

Floral Prizes on the Boston & Maine.

The Boston & Maine has lately announced its regular annual prizes to station agents for the best flower displays. The first prize is $50 and others are $40, $25, $20, $15, $10 and $5. Altogether several scores of prizes were granted. The first prize went to Lake Street station, Arlington, Mass., and second-class prizes to Brattle (also in Arlington), and to Hill Crossing, in Belmont. From photographs, with which we have been favored by the *Boston & Maine Messenger*, we show views of the floral displays at Lake Street, Brattle and Meadowview.



Lake Street Station, Arlington, Mass.; Boston & Maine.

Keeping Track Free of Vegetation.

In a report on this subject to the Roadmasters' and Maintenance of Way Association, J. W. Guffey, Roadmaster of the Santa Fe at Guthrie, Okla., said:

I have about 35 miles of dirt track with a rich sandy soil. It is in a hilly country where it is necessary to keep the track almost clear of weeds and grass, and we have to keep it cut about six months in the year. In the spring when the weeds and grass get up high enough to commence to give us trouble, we take our shovels and cut the grass from the ends of the ties and between the ties from the outside, and only cut inside the rails as far as the shovel will cut by running it under the rail between the ties. This can be done at a cost of about $7.50 per mile. We repeat this about every six weeks, just cutting the grass from the outside until about the first of October; we then cut it clean, inside and outside, at a cost of about $12.50 per mile. The total cost is:

Three cuttings at $7.50 each	$22.50
Final clean-up	12.50
Total per year per mile	$35.00

This will keep the grass out of the way of trains, but will not keep the track clean, as it provides for a thorough clean-up once a year only. We use a light steel shovel with a handle about 3 ft. 10 in. long.

I have had no experience with a weed burner and understand that so far they have been a failure, as they do not kill the grass, but only crop it off, and the grass is as fresh and green as ever in a few days, just as plentiful as it was before the burner was run over it. Thirty-five dollars a mile looks to be a big cost for cutting grass for one season, but it is approximately what it has cost this year on the dirt track that I have charge of.

The mileage of steam railroads in Greece is 865 miles, and their total capitalization $42,200,000. They are not owned by the Government, but are built after its permission, supervision and control through the department of public works, railroad section. The state shares in part of the construction, and hence controls the passenger and freight rates and other details. The Government participates in the benefits and has the option of buying over the roads within a specified period, while at the lapse of another period the railroads become the property of the state. The motive power of the first railroad built in Greece was put in operation in 1869, running from Athens to Piraeus, six miles. Its motive power was changed from steam to electricity about two years ago.

Brattle.

Meadowview.

Boston & Maine Station Grounds at Brattle and Meadowview, Massachusetts.

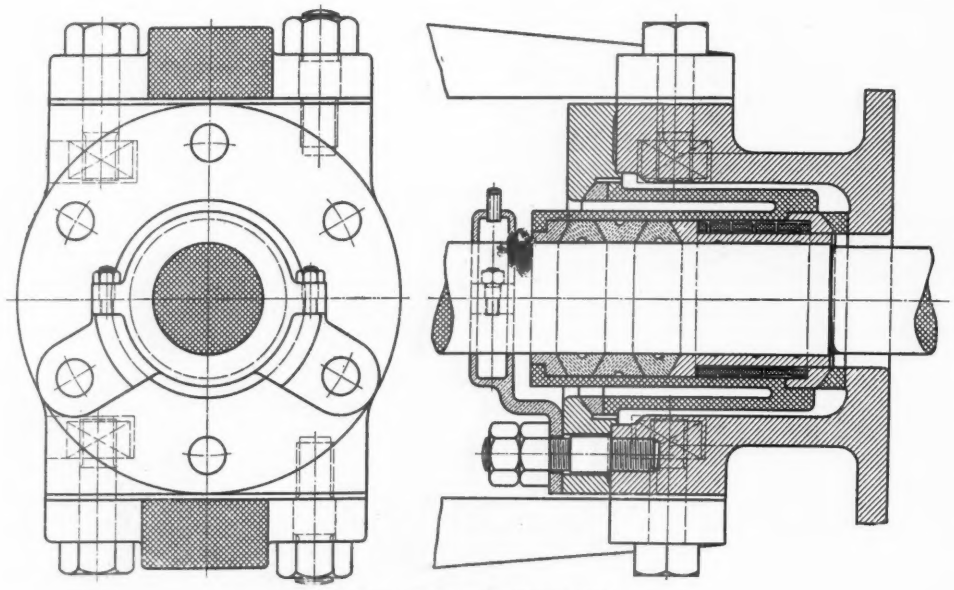
Pistons and Valves for Superheated Steam.

When superheated steam was introduced on the Prussian State Railways as few changes as possible were made in the regular standard running parts of the locomotives to which it was applied. At the same time there was a full appreciation of the fact that it would be necessary to make some changes in those parts with which the steam came into direct contact. The redesigning of these parts was undertaken by Herr Schmidt, and this has been so successfully accomplished that the usual wear and tear of the valves, cylinders, pistons and stuffing-boxes, inherent previously to the use of superheated steam, does not now exceed that of ordinary saturated steam locomotives. Even where the temperature has been as high as 720 deg. Fahr. no trouble has been experienced, though the ordinary temperature of the superheat is but 650 deg.

In working out these details it was found that the cylindrical walls of the valve chest should be separated from the shell of the cylinder itself in order that injurious strains, due to the inflowing superheated steam and the unnecessary transmission of heat and consequent heat losses, may be prevented, as would be the case if the piston-valve casing and cylinder were made in one. Relief valves must be fitted to the cylinders, and snifting valves to the valve chest or steam pipe. Forced lubrication, with mineral oil having a high flash point is essential for the purpose of ensuring efficient lubrication.

In order to insure that the piston shall be steam-tight and produce the minimum amount of friction, the so-called Swedish pistons are generally used. These are provided with three small rings, having specially arranged circumferential grooves and holes, so that the steam entiring behind the rings merely presses them lightly and evenly against the cylinder walls. Neither the piston-rings nor the stuffing-boxes ought to carry the weight of the body of the piston; for this reason tail-rods are employed, so that the weight of the piston is taken at the front end by a specially provided guide and at the back by the cross-head.

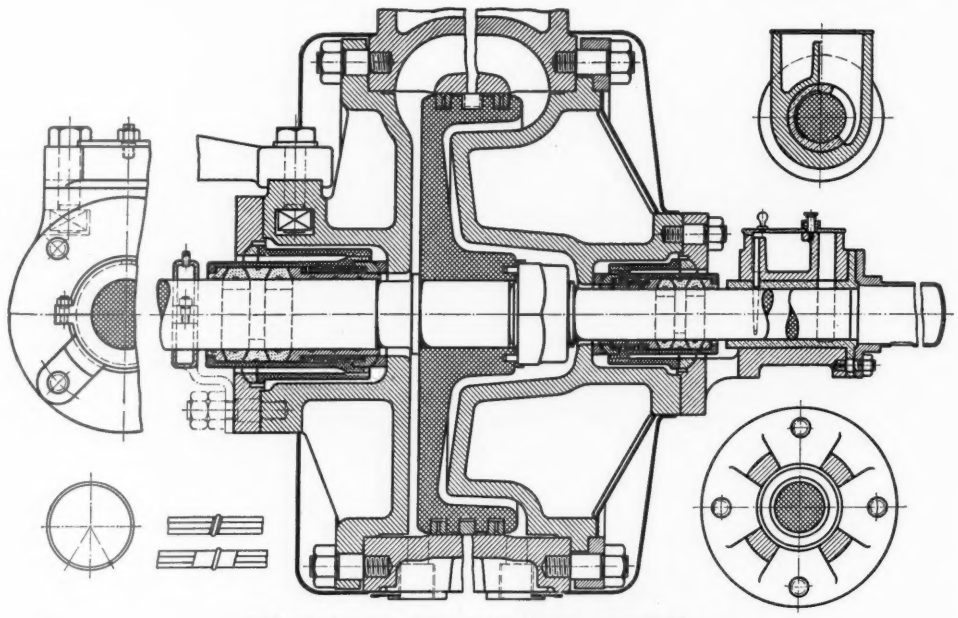
In order to obviate overheating of the stuffing-boxes special provision is made for cooling them by air. As the rigid stuffing-box had no provision at all for cooling, it was not at all satisfactory when superheated steam was used. For such conditions metallic packing only is suitable, and the stuffing-boxes have been so designed as to allow of a lateral movement of the piston-rod without, at the same time, permitting leakage, while the gland containing these rings has been so designed as to be continually cooled by air, so that a moderate temperature may be maintained. As may be seen, each stuffing-box is fitted with movable spherically seated packing rings. The sleeve containing the white metal packing rings and the cast-iron ground ring is cored out to obtain cooling by air over its entire length. The necessity for this air-cooling was forcibly illustrated at the trials of the first superheated steam engine, in which no provision for cooling had been made, and, consequently, the white metal rings melted as soon as a high degree of superheat was reached.



Stuffing Box for Piston Rod.

The outer packing ring is placed in the same transverse plane as the middle packing rings, in order to avoid canting the latter. In the same manner excessive pressure of the cast-iron ground ring against the piston-rod is prevented, so that overheating of the rod is impossible. The packing rings are held in position by the steam itself, aided by a spring. The latter prevents the rings from being carried along by the returning rod, and it also forces the packing rings on their seats without in any respect impairing the flexibility of the whole arrangement.

In order to reduce the frictional resistance of the valves, and with it the wear, to the smallest amount solid rings have been used.



Piston for Superheated Steam Locomotive.

As the difference in expansion between the valve and its case would be considerable, it was necessary to reduce the diameter to a minimum. For this reason double admission ports have been adopted, so that it is impossible to keep the diameter of the valve almost as small as the exhaust pipe. This has made it possible to use a diameter of but 6 in. on all of the engines of the Prussian State Railway, and this has been found to be amply sufficient.

The tendency of ordinary piston valves to seize, if too tightly fitted, has been avoided by jacketing the walls of the valve case with steam. This insures a uniform expansion throughout the whole length of the case and steam leakage is reduced to a minimum, and even this loss is more than compensated for by the reduction of friction. Preliminary warming up of the casing, before starting the engine, is unnecessary; nor is there any liability of the valve seizing during working. The wear, also, is very slight, and, in some cases, none can be detected after a year of service. The quantity of lubrication required is very small and the load on the reversing gear is light. The construction of the valve is clearly shown in the engraving.

Although excellent results have been obtained with this valve, one with a split ring has also been designed in order to avoid the accuracy of manufacture that is required with the solid ring.

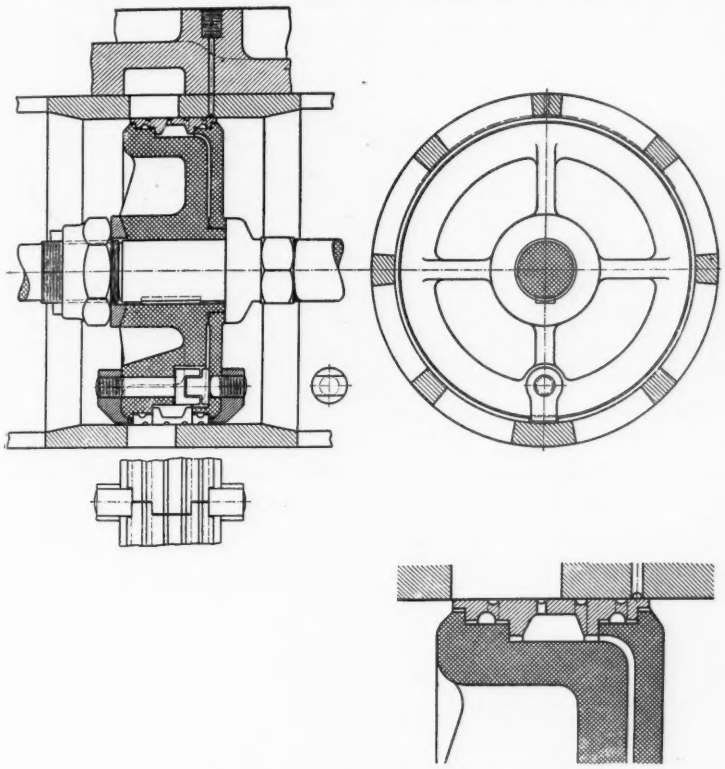
In this second type wide rings are used instead of the usual narrow ones, as experience has shown that the narrow are not suited for use with superheated steam. These broad rings are provided with several steam-tight spaces on the inside of each ring, which communicate with the steam port by means of radial holes about $^{3}/_{16}$ in. diameter, arranged circumferentially around the ring. Thus pressure on both sides of the ring is equalized, so that it is only pressed against the lines by its own tension which is sufficient to secure tightness.

In order to obtain a good fit between the valve end and the ring, and between the ring and the valve body, without jamming the ring between the two, the valve end is made with a certain amount of elasticity, and is only screwed up against the valve body at the center, leaving the outer periphery to be pressed on by the steam.

The steam pressure in the valve chest is thus made to insure the tightness of the rings, while at the same time the elasticity of the cover gives the ring sufficient freedom for expansion. As during admission the pressure on both sides of the cover is the same, the ring adjusts itself independently of the valve end or cover. During

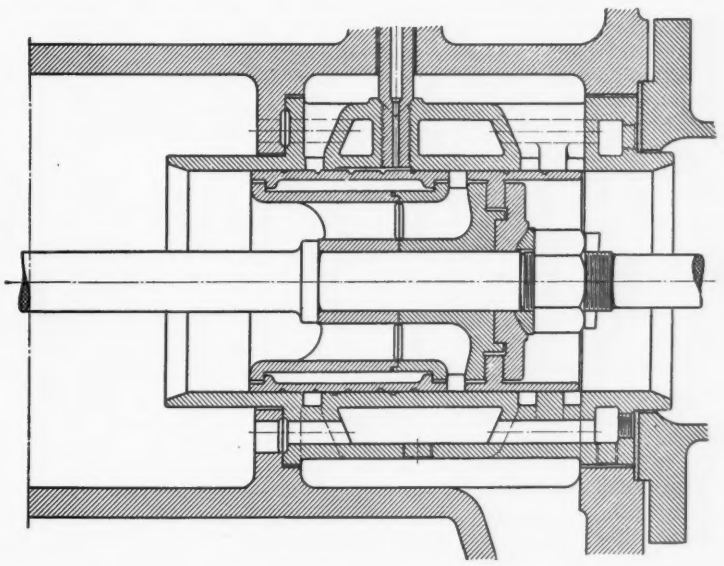
exhaust, however, the ring is held in position by the cover until readmission takes place. Excessive outward pressure of the ring against the liner, and consequently excessive friction is thus prevented.

The resistance to motion of this type of piston-valve is very small and the wear of the rings correspondingly slight.



Schmidt's Piston Valve with Steam Jacketed Casing, Double Admission and Solid Rings.

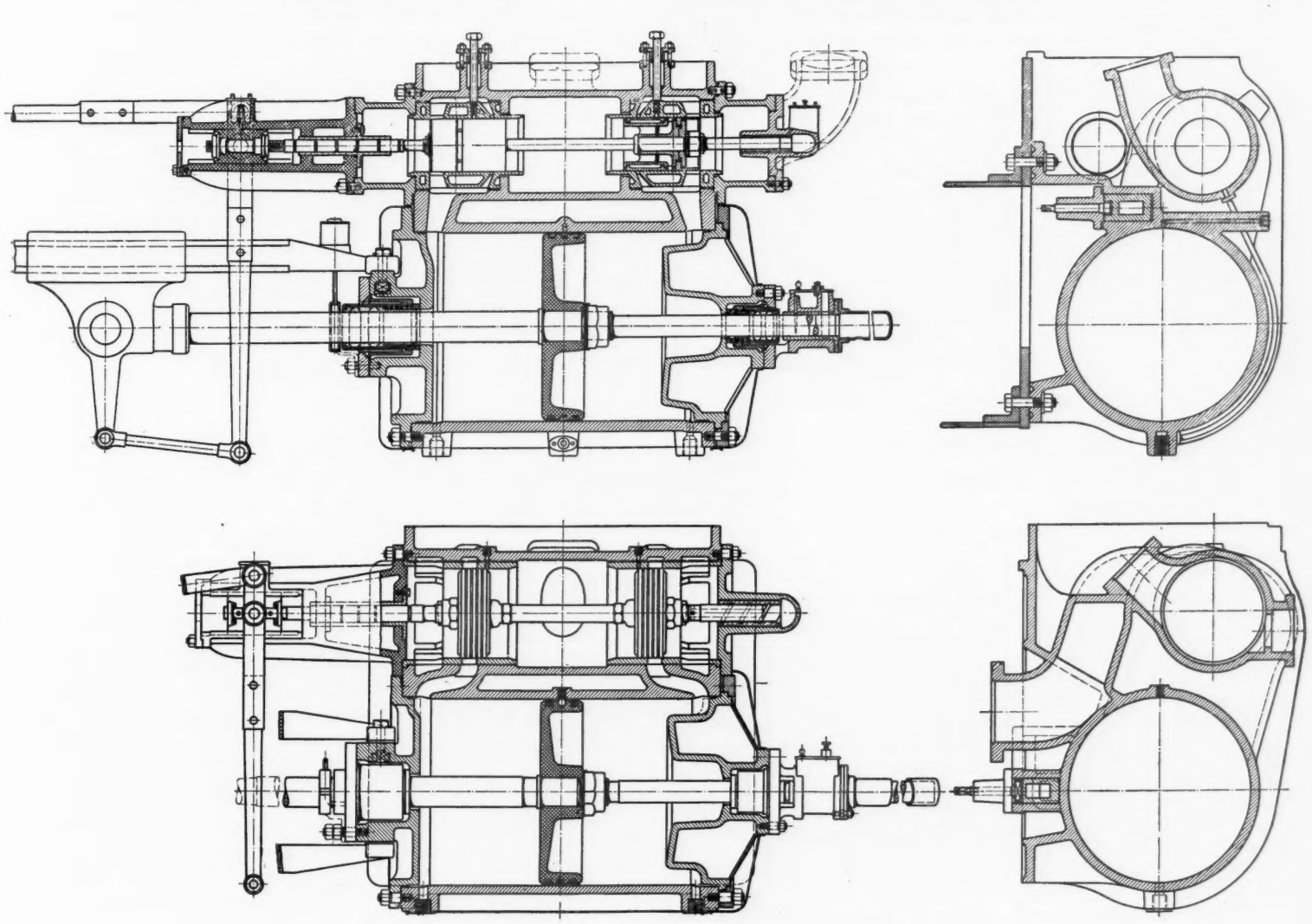
As compared with the solid ring type of valve, this modified type has the advantage of remaining absolutely steam-tight so long as there is any elasticity in the rings. The split or cut in the rings must always be placed opposite the broad bridge of the liner, so as to prevent leakage through the cut. The cut in the ring is protected on the outside by a cover, which is fixed respectively to the valve body and to the valve end or cover. The screws holding the split covers



Schmidt's Piston Valve with Steam Jacketed Casing, Double Admission and Solid Rings.

prevent the rings from turning. Hence, in cases where the split covers are cast on, special set-screws must be provided for this purpose.

These piston-valves, with split-rings, have been in use for a number of years with marked success, and have been adopted by most railways using superheated steam.



Cylinder and Valve for Superheated Steam Locomotive; Schmidt's System.

A Removable Driving Box Brass.

The scheme illustrated herewith for holding driving box brasses, instead of pressing them in, was devised by Charles Markel, shop foreman of the Chicago & North-Western at Clinton, Iowa. It is simply the use of a wedge-shaped steel key, which is driven between one extremity of the brass and a shoulder of suitable size and shape in the box. A movement of the key of 1⅜ in. is provided for, and it is claimed that when driven home it holds the brass so securely that a hydraulic pressure of 40 tons is required to start it. Removal of the key is accomplished in the manner shown in one of the illustrations. There is a tapped hole in the end of the key for this purpose, and also for the insertion, loosely, of a hexagonal-head bolt which, besides keeping the hole closed ordinarily, is used to drive against, saving the end of the key from injury. Also, there is a tapped hole in one end of the brass to receive a bolt for removing the brass by hand. A set-screw through the side of the box prevents the key from working out.

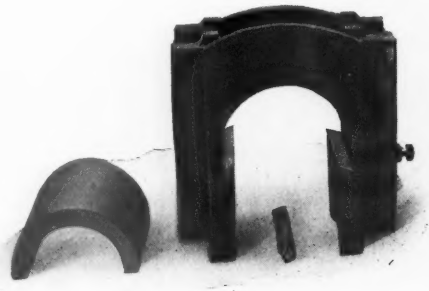


Fig. 1—Markel Driving Box Brass.

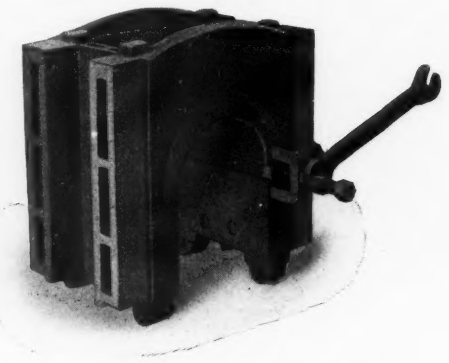


Fig. 2—Markel Driving Box Brass.

The scheme insures an effective fit of the brass in the box, it is claimed, avoiding one of the bad points of the pressure method. For in the latter, even though 30 or 40 tons pressure may be exerted in forcing the brass in, the bearing is uncertain and may be on a few points only. The working of the locomotive soon pounds it to a better bearing, producing a loose brass. By the method here shown the brass is turned $^1/_{32}$ in. smaller than the box fit, and when the key is driven the brass is forced to a tight, solid contact with the box.

If heating or some other cause loosens the brass it can be tightened at once by further driving of the key. To remove a brass for shimming or replacement it is only necessary to lift the weight of the box from the journal and pull key and brass; the operation is as simple in reverse order, the whole being done in a minimum of time. This latter is one of the important advantages, of course, as a full change of brasses by present methods means two or three days' work and $16 to $24 in labor cost. By the new method it can be done in from two to 12 hours, depending on the number of driving wheels and the kind of valve gear. The new method also permits satisfactory shimming of the brasses, a practice which most roads have abandoned because of the troubles with it; the brasses may therefore be worn down as thin as desired and be held tight at all times by the key.

The boxes are in service on several North-Western locomotives and the results have been entirely satisfactory. The first engine equipped was an Atlantic type, in fast passenger service, in April, 1906. There has been no trouble with the brasses and they are in good condition at the present time. Other engines of the same type have been equipped since with equally good results. The Duluth, Missabe & Northern has had a box in very heavy service since May, 1906, likewise with satisfactory results. In the general use of the device the box openings can be made to a standard for each class of locomotive and brasses and keys kept in stock. The only machine work at time of application therefore is to fit the brass to the journal. Jigs and templets and methods of machining to produce all parts in exact duplicate with the least work have been devised by the inventor. The Locomotive Improvement Co., Clinton, Iowa, has been formed to sell this and other devices. As the removable brass can be applied to boxes now in service, the company does not intend to make boxes and brasses at present. Instead, the use of the scheme by railroads will be licensed on a royalty basis.

Roadmasters' and Maintenance of Way Association Convention.

The Roadmasters' and Maintenance of Way Association held its twenty-fifth annual convention in the Sherman House, Chicago, Nov. 12, 13 and 14. President C. H. Cornell (C. & N.-W.) was in the chair and about 70 members were in attendance. The opening address was made by R. H. Aishton, General Manager of the Chicago & North-Western. President Cornell followed with an address in which he stated that the association, which for a time was exhibiting signs of weakness and decline, is again in vigorous and prosperous condition. The secretary reported the addition of 48 members. The subjects discussed by the convention were: Maintaining Track in Line and Surface in the Winter; Wrecking Outfits—Organization and Working; Cost of Ballasting Old Track and Renewing Ties; Organization and Working of Rail-Laying Gangs; Method of Destroying Vegetation in Track.

Two of these reports were reprinted last week; others will be found in the present issue and in subsequent issues.

At the Thursday forenoon session, W. M. Camp, editor of *Railway and Engineering Review*, read a paper entitled "Why Efficient Track Work is Skilled Labor."

Following the custom recently adopted by this association, the supply men were given the privilege at one of the sessions of explaining their devices, five minutes' time being allowed the representative of each firm. A number availed themselves of the opportunity.

The officers for the ensuing year are: President, J. A. Kerwin (Mo. P.); First Vice-President, A. E. Hansen (C. & N.-W.); Second Vice-President, W. A. Brant (C. & N.-W); Secretary and Treasurer, W. E. Emery (C. & A), re-elected; Members Executive Committee, T. Thompson (A., T. & S. F.), W. H. Kofmehl (C., M. & St. P.), J. Muschott (P. M.), and B. A. West (A., T. & S. F.). The next place of meeting is Milwaukee, Wis.

Following is a list of the exhibits at the convention:

Adams & Westlake Co., Chicago.—Switch, semaphore and other signal lamps.

American Flange Frog & Railway Improvement Co., St. Louis, Mo.—Models of the "Graham" flange frog.

American Hoist & Derrick Co., St. Paul, Minn.—Photographs of "American" ditchers.

American Rail Joint Company, Niagara Falls, N. Y.—Models of the "American" rail joint.

American Railway Device Co., Chicago.—"Economy" separable switch joints, "Odenkirk" switchstands, anti-rail creepers.

American Steel & Wire Co., Chicago.—Samples of woven wire fencing, wire rope, "Cooper" rail bonds and electrical wire.

The American Track Barrow Co., Lowell, Mass.—Models of track barrows and rail pony cars.

American Valve & Meter Co., Cincinnati, Ohio.—"Economy" switchstands, and catalogues of Poage water columns and tank fixtures.

Atlas Railway Supply Co., Chicago.—Atlas rail joints, braces and tieplates; Atlas improved switchstands.

Louis Blessing and Alfred Johns, Jackson, Mich.—Cable-loop reinforced concrete ties and adjustable keyed nut-lock.

Border Bolt & Nut Lock Co., Richmond, Ind.—Samples of bolts and nut locks.

Buda Foundry & Manufacturing Co., Chicago.—Track jacks and rail drills; hand and push car wheels; switchstands; track gages and levels; track-tool grinders.

The Cleveland Frog & Crossing Co., Cleveland, Ohio.—The "Prentice" anti-rail creeper.

Commonwealth Steel Co., St. Louis, Mo.—Photographs and pamphlets of cast-steel gasolene weed burner.

Cook's Standard Tool Co., Kalamazoo, Mich.—Track drills, track tool grinders and cattle guards.

Coulter & Paxton, Longmount, Colo.—Models of improved track wrench and clamp.

Dilworth, Porter & Co., Ltd., Pittsburgh, Pa.—Samples of Glendon flange and Goldie claw tieplates.

The Eyeless Tool Co., Newark, N. J.—Eyeless picks and solid steel track tools.

Fairbanks, Morse & Co., Chicago.—Gasolene motor car, Barrett track jacks and rail drills.

Gibraltar Manufacturing Co., Chicago.—Model of "Gibraltar" pumping post.

Wm. Goldie, Jr., & Co., West Bay City, Mich.—Goldie perfect tie plugs.

Grip Nut Company, Chicago.—Samples of grip nuts.

Hart Steel Company, Elyria, Ohio.—McKey rolled steel shoulder tieplates and open-hearth steel spikes.

Hayes Track Appliance Co., Geneva, N. Y.—Hayes derails, with operating and target stands.

Hussey Binns Shovel Company, Pittsburgh, Pa.—Shovels, spades and scoops.

Kalamazoo Railway Supply Company, Kalamazoo, Mich.—Hand and velocipede cars, Moore track drills, and Kalamazoo track jacks; track gages and levels, and curve lining gages, pressed steel wheels.

National Lock Washer Co., Newark, N. J.—Samples of spring nut locks.

Pennsylvania Steel Co., Pittsburgh, Pa.—Manard manganese anvil-faced frog, design 160.

Quincy, Manchester, Sargent Company, Chicago.—Bonzano rail joint, Q & C compromise and insulated joints, Cafferty tie tongs, anti-rail creepers.

The Rail Joint Company, New York.—Rail joints of the continuous, Weber and Wolhaupter types.

Railroad Supply Co., Chicago.—Tieplates and derailers.

Railway Specialty & Supply Co., Chicago.—Mansfield combination guard-rail, clamp and tieplate, manufactured by the Otto Gas Engine Works, Chicago; P. & M. and vise-grip rail anchors, Smith improved nuts.

M. M. Riley, Ironwood, Mich.—Model of steel tie and rail.

John M. Scott & Son, Racine, Wis.—Models of "Hercules" and "Little Giant" bumping posts; Racine nut locks.

Sellers Manufacturing Co., Chicago.—Tieplaces, rail joints and splice bars.

Stover Motor Car Co., Freeport, Ill.—Gasolene motor car.

Thomas Boltless Rail Joint, Watertown, Wis.—Model of boltless rail joint.

Universal Portland Cement Co., Chicago.—Samples showing different stages in the manufacture of "Universal" Portland cement.

United States Wind Engine & Pump Co., Batavia, Ill.—Switchstands, semaphores and water supplies.

Worth Wire Works, Kokomo, Ind.—The "Cinch" wire fence stay.

The Beech Grove Shops of the Big Four.

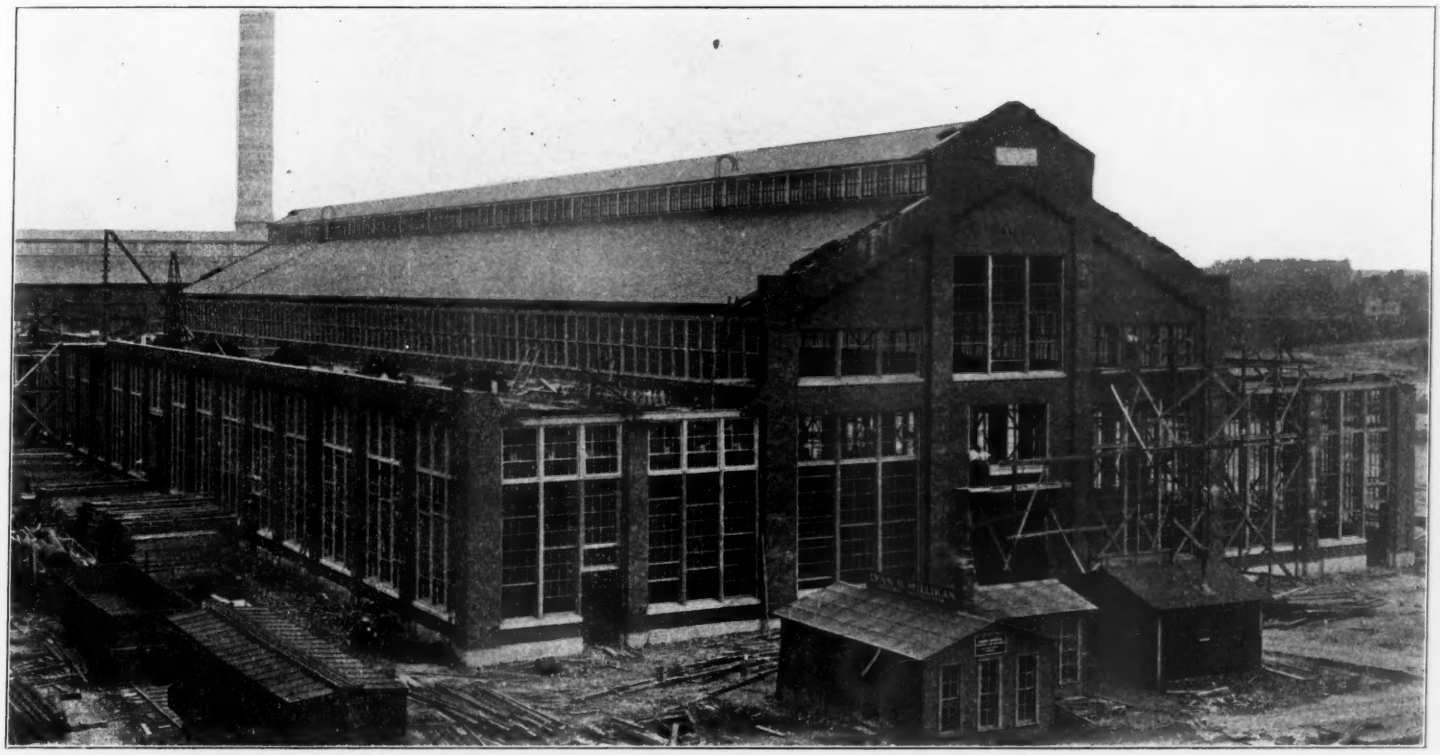
The Cleveland, Cincinnati, Chicago & St. Louis (Big Four) expects to have the locomotive department of its new shops at Beech Grove, Ind., ready for occupancy by December. The principal buildings, with the exception of the storehouse, are near completion and the installation of tools and equipment will follow as fast as practicable. This plant, when fully completed, will be one of the notable railroad shop plants of the country both in size and all other features that characterize the most recent practice in such shops. It is of interest therefore to review briefly the conditions attending the inception and planning of the plant, as well as to study the grouping and operating conditions.

Indianapolis is the central and most important point of the Big Four system, with lines radiating in six directions. At the present time the road is without facilities suitable to care properly for modern motive power. The Brightwood shops at Indianapolis, which were built when 35-ton engines were the standard, have long been hopelessly outgrown, with no room for enlargement and rebuilding. Some of the shops at other points, while more modern than the Brightwood plant, have neither the capacity nor the facilities for present needs. The construction at Indianapolis of a new plant entire, to care not only for the equipment of the divisions centering there, but also for the heavy locomotive repairs of the whole road, and on a scale which looked well into the future, had therefore become a necessity. Preliminary work was begun early in 1906. It will be recalled that a committee of motive power men of the New York Central Lines, of which the Big Four is a part, was appointed to visit the largest of the different new railroad shops and from their study of same determine the nature and general characteristics of the plant required for the Big Four. This committee consisted of Messrs. H. F. Ball, E. D. Bronner, F. M. Whyte, R. T. Shea, W. Garstang and B. D. Lockwood.

Besides shops, the Indianapolis situation also required relief in the matter of freight yard facilities. It was therefore decided to build the new shops and a large concentration yard on a new site where not only would there be ample room for present needs, but where future growth would not be restricted. The tract selected is at Beech Grove, about six miles southeast of the city on the line to Cincinnati—the Chicago division of the road. The proximity of shops and freight yards naturally influenced the layout of the former.

The Arnold Company, Consulting Engineers, Chicago, was commissioned to prepare a preliminary report and estimate of cost of the proposed shop plant. Several block plans suitable for the particular requirements at Beech Grove were prepared and fully discussed with the railroad company's engineers, and the decision was finally made in favor of the one shown herewith, in which the eastbound classification yard is immediately north of the shops. The Arnold Company then prepared complete plans and specifications for the entire plant, including buildings, water and sewer systems, power plant equipment, air, heating and steam systems, together with electric light and power systems. This company is now acting as inspector for the entire work.

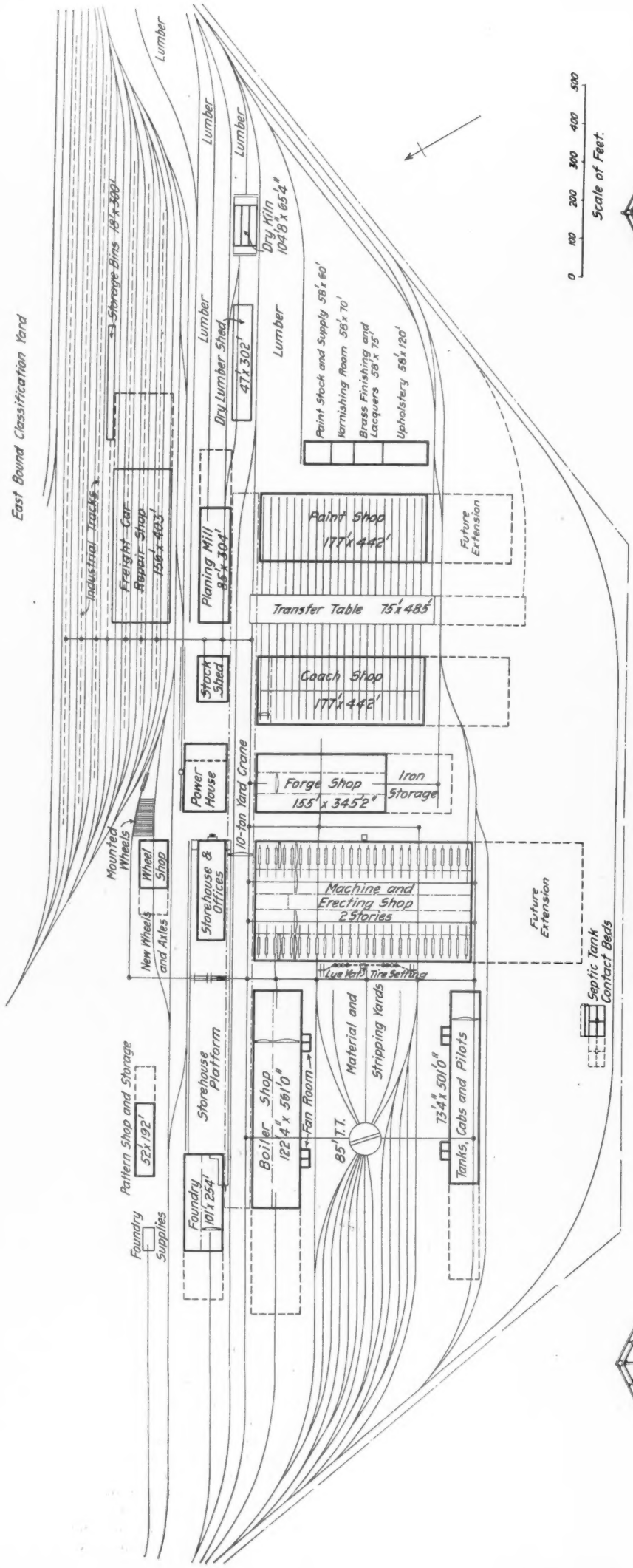
Examination of the general plan shows the central feature to be a "midway" or general supply avenue, on which all of the important buildings front. This midway is 75 ft. wide, about 2,000 ft. long, and is served by a 10-ton overhead traveling crane. There were no site limitations on the arrangement of the plant, so that the engineers were without any restrictions of this sort in the effort to secure the most efficient grouping. One of the basic conditions governing the arrangement and relation of the different departments was that the forge shop should be able to serve conveniently all three of the principal departments—the locomotive and the two car departments. Another was to have the planing mill serve the latter two and also be convenient to the power station for disposal of its refuse. The car departments having been assigned to the east end and the locomotive department to the west end of the site, the machine and erecting shop, as the central and most important unit of the latter, was put on the south side of the midway where it can be extended to double its present length if need be. The forge shop was put east of it, between it and the passenger car shop, and where product for the freight car shop can be carried across quickly and easily by small cars and the midway crane. Locomotives to be shopped are brought in at the western end of the shop yard to the hospital tracks, a part of which lead to an 85-ft. turntable, which feeds the machine and erecting, the boiler and the tank shop as the case may be. The engines will stand with their head-ends toward the center of the machine and erecting shop and therefore will cross the table in entering and leaving this shop only when a reversal of direction is necessary. Likewise, the normal routing for the cab and tank shop is through the end doors. For the boiler shop it is by way of the turntable, with emergency entrances at the ends.



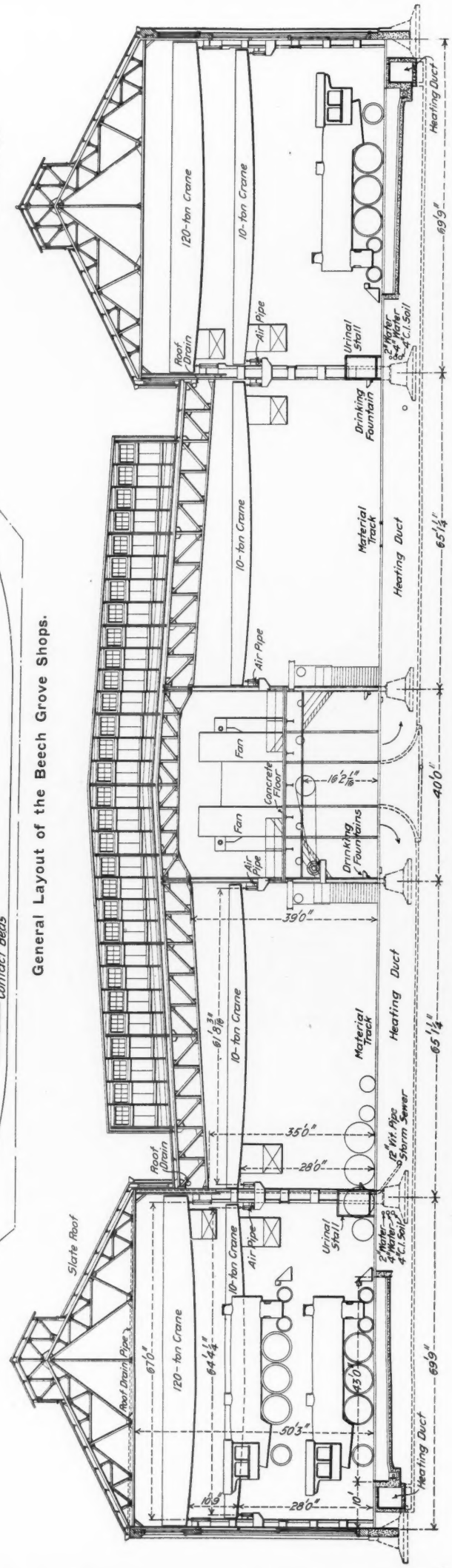
Blacksmith Shop; Beech Grove Shops of the C. C. C. & St. L.

The storehouse is placed nearest to the locomotive shop—directly across the midway from it—since the majority of the supplies carried are for the locomotive department, but is where the supplies may be received with freedom and distributed to the different departments with equal ease by means of the yard crane, its length being parallel to the runway. The location of the foundry gives plenty of scrap yard room adjacent to it and also permits raw material to be received and castings to be delivered without unnecessary handling or reverse movement. A heavy-material platform, 460 ft. long, connects foundry and storehouse and has its south side under the yard crane. The pattern shop is close to the foundry, but is isolated from the rest of the plant for fire protection.

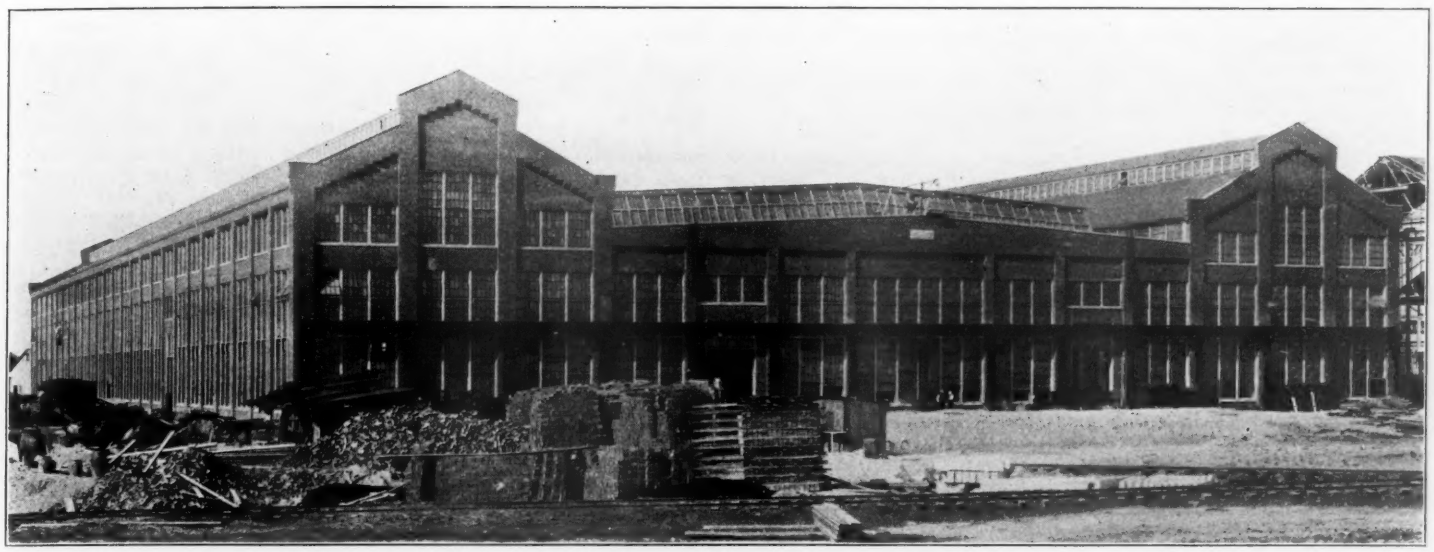
The power station has a central location on the midway and all electric cables, steam, air and water piping, etc., are carried from it to the principal buildings in a large reinforced concrete tunnel, 6 ft. 9 in. x 7 ft., under the midway. The car departments receive and store their lumber at the east end of the yard, from which it progresses through the dry kiln and dry lumber shed to the planing mill and thence to the car shops on each side. The transfer table of the passenger department connects with the yard



General Layout of the Beech Grove Shops.

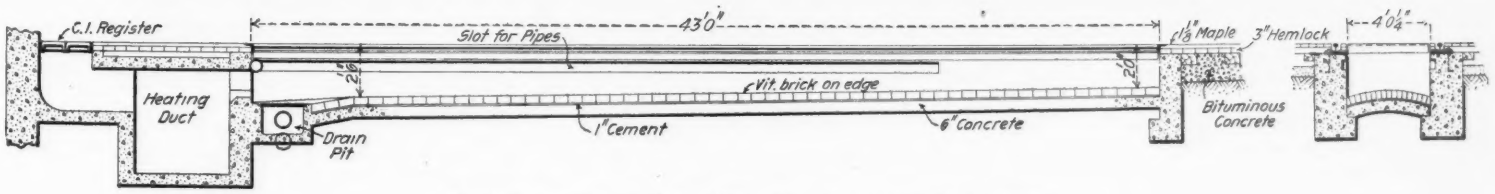


Transverse Section and Floor Details, Machine and Erecting Shop; Beech Grove Shops of the C. C. C. & St. L.



Machine and Erecting Shop.

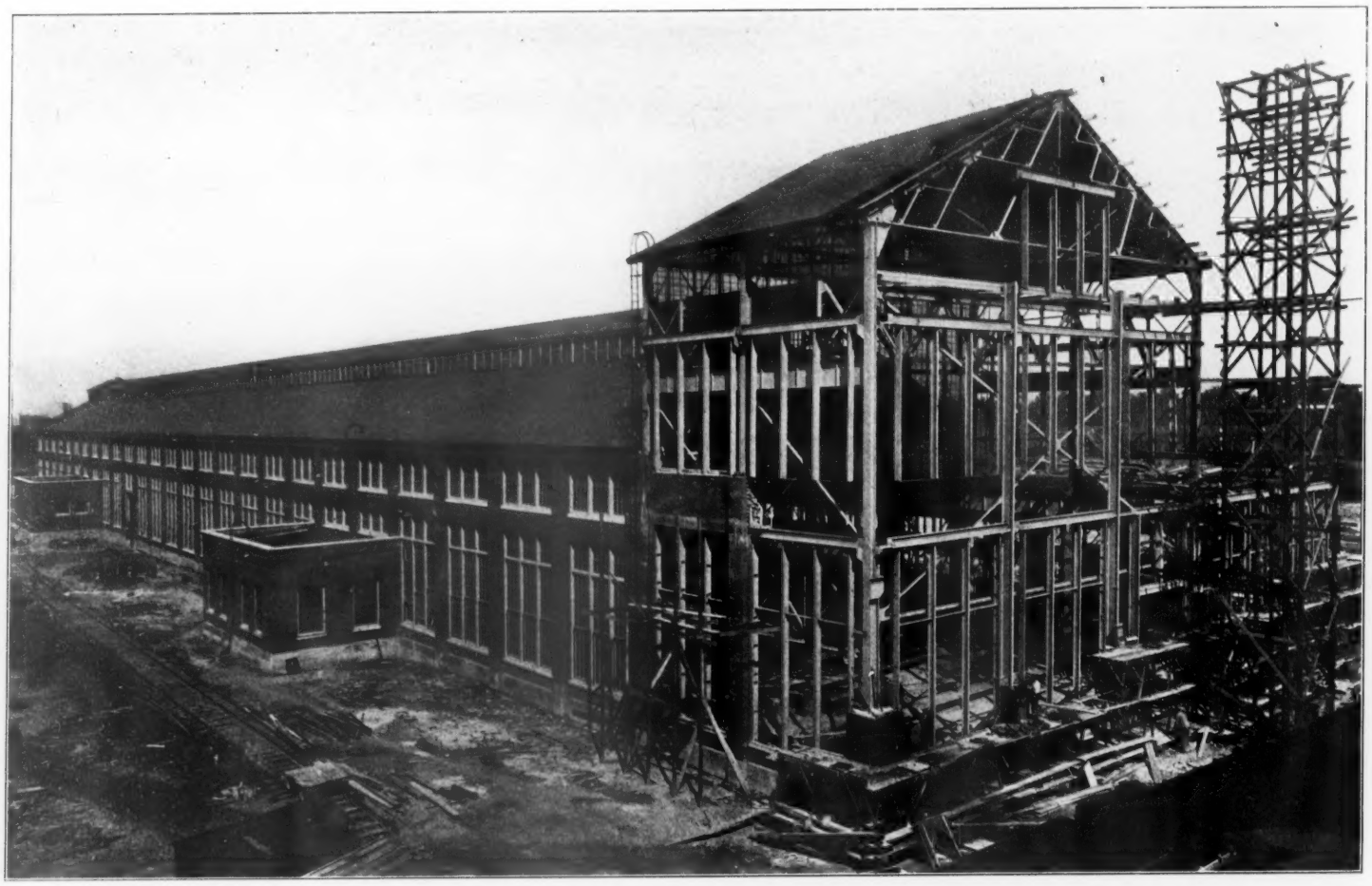
Interior View of Machine and Erecting Shop; Beech Grove Shops of the C. C. C. & St. L.



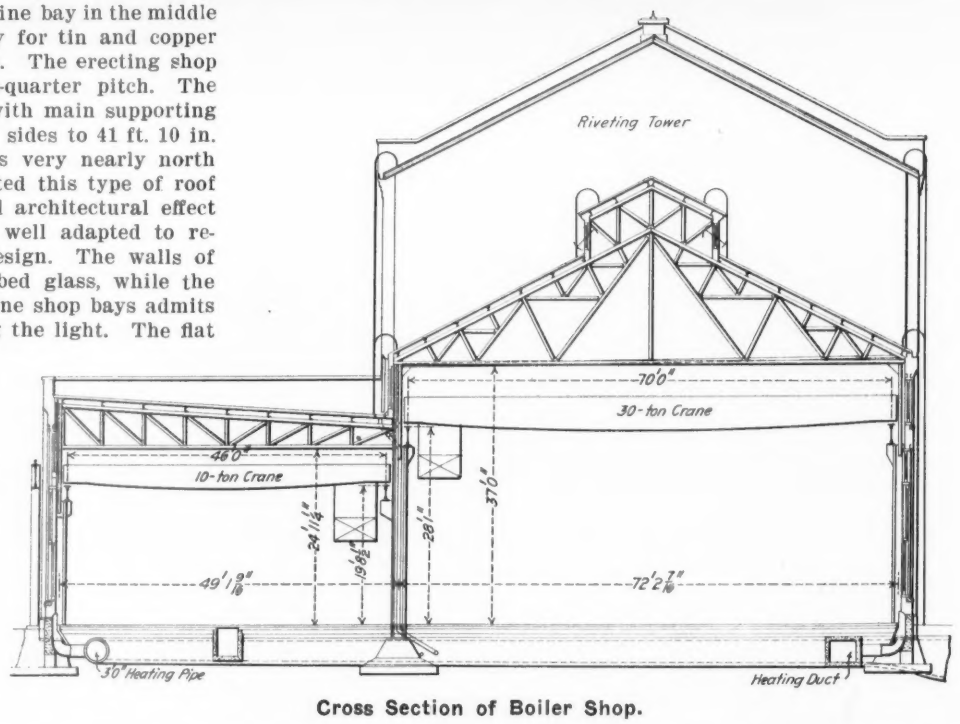
Sections Through Erecting Pits in Locomotive Shop.

crane. The freight car repair yard is adjacent to the large switching yard where cripples may be classified for the shop repair tracks and delivered to them with the least amount of switching. A minimum spacing of 75 ft. has been observed for all buildings for fire protection.

Exterior and interior views of the machine and erecting shop are shown which give an excellent idea of the building. It is 315 ft. wide and 578 ft. long. It is a structural steel building with 17 in. Colonial brick curtain walls and is supported on ample concrete foundations reinforced with steel bars. There are five bays—an erecting and a machine bay on each side and a light machine bay in the middle common to each. Over this latter is a balcony for tin and copper shop, lavatories, locker rooms and heating fans. The erecting shop roofs are covered with slate and have a one-quarter pitch. The three intermediate bays have a saw-tooth roof with main supporting trusses rising from a head room of 35 ft. at the sides to 41 ft. 10 in. at the center. The fact that the building lies very nearly north and south in the direction of its length permitted this type of roof to be used to the best advantage. The general architectural effect of the building is good, while the section is well adapted to requirements, as well as being economical in design. The walls of the building are fully 60 per cent. factory ribbed glass, while the difference in height between erecting and machine shop bays admits of large clere-story windows, further increasing the light. The flat portion of the roof surrounding the saw teeth is to serve as a hose cart runway for fire protection. All roof drains are inside, as will be observed from the cross-section of the building. Each erecting bay has a 120-ton crane 50 ft. above the floor for traversing locomotives, and a 10-ton messenger crane 28 ft. above the floor. Each machine bay likewise has a 10-ton crane. The heavy cranes have two trolleys and with full load, trolleys 30 ft. apart, they are to maintain a hoisting speed of 8 f.p.m., 100 f.p.m. trolley speed, and 175 f.p.m. bridge speed. The small cranes have a hoisting speed under load of 25 f.p.m., a trolley speed of 125 f.p.m., and a bridge speed of 400 f.p.m.



Boiler Shop; Beech Grove Shops of the C. C. C. & St. L.



Cross Section of Boiler Shop.

There are 52 erecting pits divided equally between the two outside bays. There is about 1,100 sq. ft. of machine floor space per pit, on the basis of 48 pits, since the four pits on the through tracks are for wheeling and unwheeling locomotives. The machine floor comprises a central section extending 15 ft. out from the columns of the middle bay. The remaining space between machines and material track is for the storage of material, and the space on the opposite side of each material track is for locomotive wheel storage, as shown.

A detail of the erecting pits is shown. They are concrete, with bottoms lined with vitrified brick. The heating duct runs along the outer, or wall, ends of the pits, with connections to the latter as shown. Each pit is supplied with air, steam, water and electric connections. There are two of the air outlets equipped with air-hose connections. When not in use these fit into recesses in the sides of the pit. The steam is supplied at 225 lbs. pressure for testing. Heavy work benches with cast-iron frames, fitted with drawers and tool racks, will be placed between pits. On the posts at each bench, 8 ft. above the floor, are triple outlet boxes for either light or power connections. Two air outlets fitted with air-hose connec-

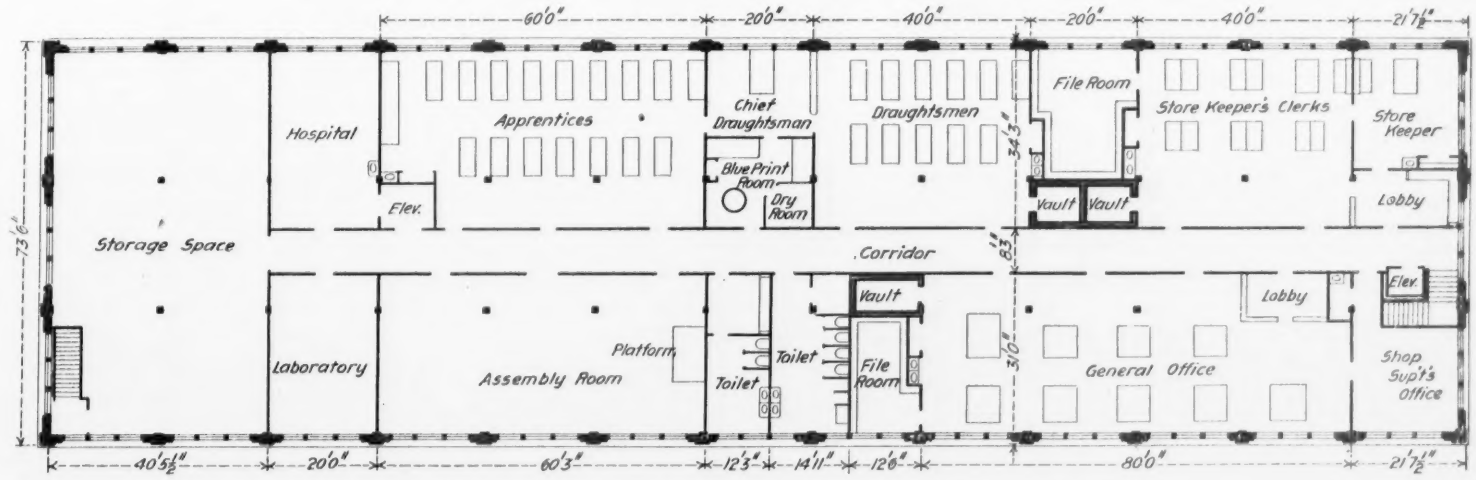
tions, and one 2½-in. hose valve water connection, are located on alternate columns between machine and erecting bays at a suitable height above the floor. The air piping is run overhead with drops at these columns. There is also an air connection on each alternate column on both sides of the light machine bay. Water hose connections are made to the roof at intermediate points for fire protection. The floor of the shop is 1⅛ in. maple crossed on 3 in. hemlock planks, the latter nailed to 4 in. x 6 in. sleepers buried in 7 in. of bituminous concrete. Beneath the concrete is 6 in. of screened gravel. The balcony floor is concrete.

The building is heated by six separate hot-blast outfits. Each outfit consists of two 240 in. full-housed fans, each fan direct-connected to a 12 in. x 12 in. vertical enclosed side-crank engine. The intake of air is through 20 sections of heating coils, 9 ft. x 9 ft. 3 in., arranged in four groups. The coils are heated by exhaust steam from the power station. A vacuum system is maintained by piping condensed steam returns to vacuum pumps in the power station. The fans and coils, as already mentioned, are located in the balcony. They discharge downward to reinforced concrete ducts under the floor, each of which runs across to connection with a duct which encircles the entire building just inside the walls. Outlets from the latter discharge into the erecting pits and through registers in the floor under each window. The duct around the building also carries the air, steam and water piping for pit service.

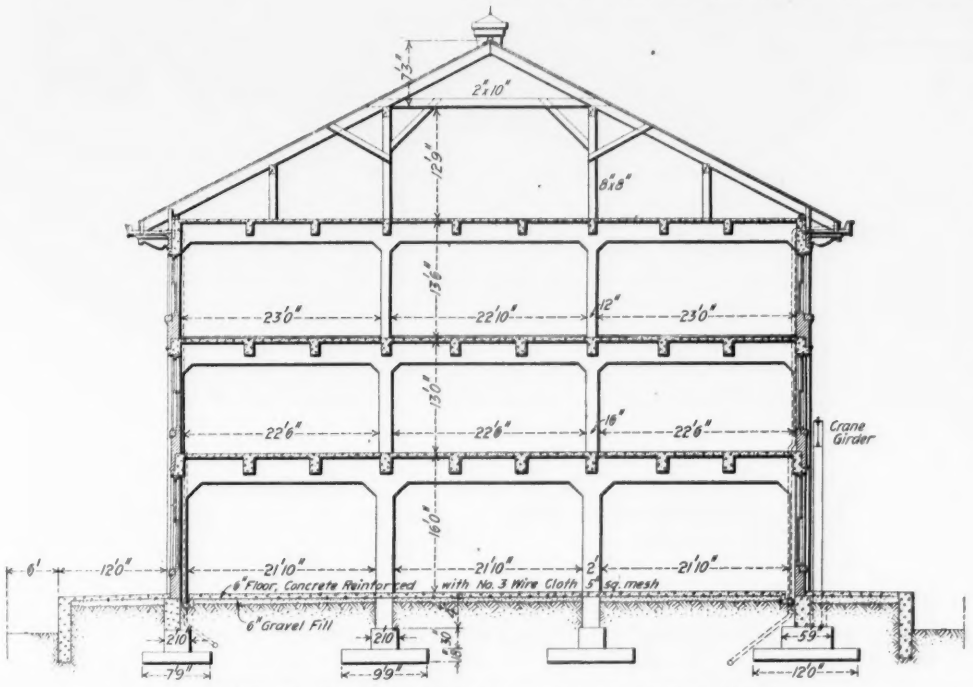
The boiler shop is 126 ft. x 564 ft. A view of it from the riveting tower end, which is the end adjacent to the machine and erecting shop, taken before completion, is shown. The cross-section of the building shows it to consist of a main bay and a side bay, 72 ft. and 49 ft. wide respectively. The former is served by a 30-ton, and the latter by a 10-ton crane. The general structural features of the building are similar to the machine and erecting shop. However, the west wall of the riveting tower, which is carried by the main bay truss, is made of concrete on expanded metal in order to minimize the weight. The building will be heated in the same way as the machine and erecting shop. The fan rooms are built on the south side of building, as seen in the photographic view.

The blacksmith shop is 154 ft. x 344 ft. in three bays. The dimensions and details of the main and side bays are the same as the similar bays of the boiler shop and therefore a cross-section is not shown. The central bay will have a 10-ton electric overhead traveling crane, a feature which few railroad blacksmith shops possess as yet. The operator's cage will come to within 8 ft. 6 in. of the floor to get below the smoke and gases as much as possible. The floor of the shop is formed of 2 in. of front-end sparks overlaying 6 in. of cinders on a foundation of 10 in. of clay and gravel. There is a mezzanine floor for the foreman's office, lavatories, lockers, etc. The building is heated directly from steam piping.

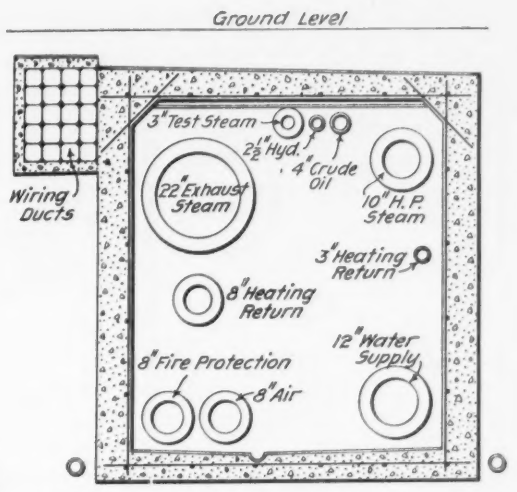
The storehouse and office building is to be of fireproof construction, except the roof timbers and their supporting columns. It will be 73 ft. x 263 ft., three stories high. It will have a self-supporting reinforced concrete frame with Colonial brick exterior



Third Floor Plan of Storehouse; Beech Grove Shops.



Cross Section of Storehouse; Beech Grove Shops.



Section Through Power Tunnel, 6 ft. 9 in. x 7 ft.

walls, cut stone sills, slate roof and copper cornice. A 12-ft. platform will extend the full length of both sides of the building. It also will be reinforced concrete, with a granitoid top finish, which will likewise be the finish for the storehouse floors. The two lower floors are to be for store purposes and the upper floor for offices, as shown by the plan of same. It will be seen that it includes a hospital, to care for employees injured in the shops, and a room for apprentices, where they will be given daily instruction in accordance with the scheme now in force on all New York Central Lines. The third floor offices will have maple floors and be trimmed in oak. The hospital and toilet rooms will have tile floors with marble base. There is also a large assembly room on this floor for committee meetings, conventions, lectures to shop men, etc., and a lavatory. There will be one electric elevator for passengers and two for freight. The building will be heated directly from steam radiators. It will be equipped with a telephone exchange with connections to all departments of the shops.

The power station is shown partially completed in one of the

views. It is 114 ft. wide and 128 ft. long, the architecture harmonizing with the buildings already described. The substructure is concrete, the column piers being reinforced, and the substructure masonry is shale brick of a dark color lined with sand lime brick. The turbine room is finished with a red pressed brick wainscoting about 6 ft. high. The roof is slate on wood sheathing.

The liberal use of large windows in the side walls, and monitors and skylights in the roof, give a well-lighted interior. The building at present is closed at the east end by a wooden bulkhead to allow for future extension, which is contemplated at an early date. The power station will ultimately be twice its present size.

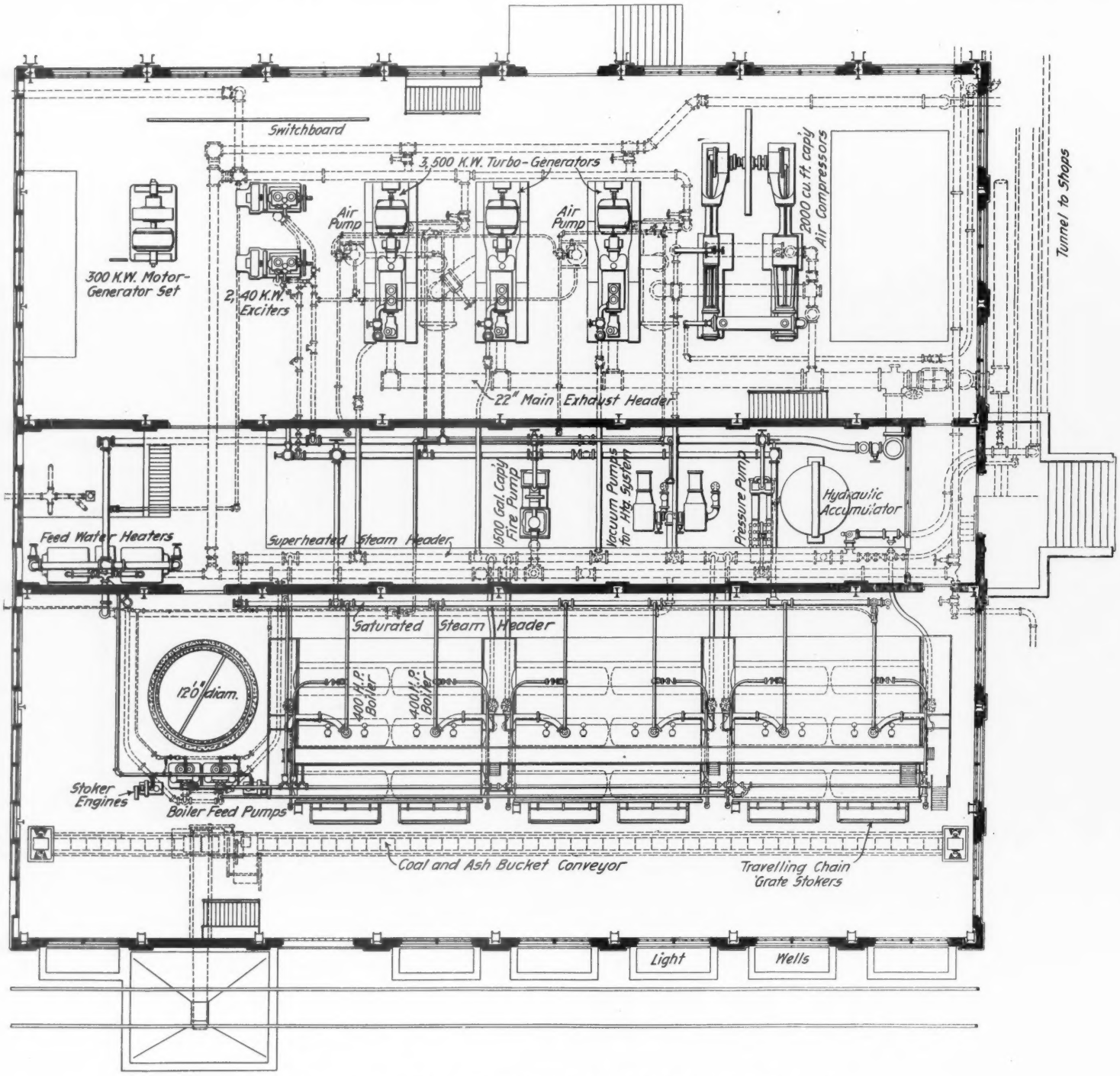
The boiler room is 46 ft. x 128 ft. It contains three batteries of two 415 h.p. Stirling water-tube boilers, each equipped with Foster superheaters and Greene chain-grate stokers. The boilers are connected to the stack by an underground reinforced concrete flue. The chimney is a Weber concrete-steel design, 12 ft. in diameter and 200 ft. high, equipped with lightning conductors.

Coal is stored in overhead reinforced concrete bunkers, and is fed direct to the stoker hoppers by steel spouts. The coal and ash handling machinery is the Link-Belt design. The coal is dumped from cars into a track hopper outside the building, and is carried to a crusher inside the building by a small apron conveyor. It falls from the crusher onto an endless bucket conveyor in the basement which passes up over the storage bunkers, automatically dumping into same. The ashes are fed to this same conveyor by spouts from the doors in the ash bins of the boilers. They are dumped into overhead ash pockets, located in front of the stack, from which they may be loaded through spouts into cars outside the building. The boiler feed pumps are of the Dean duplex, upright, Admiralty type. The boiler room contains a number of structural steel runways, making all piping and apparatus easily accessible for repairs.

The turbine room is 46 ft. wide and 128 ft. long, with a 12 ft. basement underneath. The main generating units comprise three Westinghouse-Parsons steam turbines, direct-connected to 500 k.w., 60 cycle, three phase, 3,600 r.p.m., 480 volt generators. There are two steam-driven, direct-connected 40 k.w. exciter units, and adjacent to same is a 300 k.w. Westinghouse motor-generator set for supplying 250 volt direct-current to variable speed tools. There is room for another exciter unit and a motor generator set.

It is the intention to run the compressor, which is a Laidlaw-Dunn-Gordon 2,000 cu. ft. cross-compound type, and the turbines condensing, and there are two wet vacuum system condensing outfits, consisting of two Wheeler Admiralty-type surface condensers and two steam-driven air pumps. The condensers each take care of two units, so that each unit may be run condensing or thrown on to the heating system at will. The exhaust steam from the auxiliary units is carried to the feed-water heater by a separate system of auxiliary piping.

The generators connect to the switchboard by lead-covered, paper-insulated cables laid in tile ducts in the concrete floor. The switchboard has 15 panels, 12 of which are for present use. It is equipped with Westinghouse instruments and I. T. E. circuit breakers, and is built by the Walker Company. In the floor back of the switchboard and running its entire length is a slate covered trench 14 in. wide and 8 in. deep. All ducts to the switch-



Plan of Power House; Beech Grove Shops of the C. C. C. & St. L.

board lead to this trench, and cables turn up through openings in the slate cover to the circuit breakers. Feeders go out at right angles to the switchboard in clay ducts in the floor to the south basement wall, where they drop 6 ft. in split tile ducts laid in chases in the wall to the underground conduit system. Thus all power-house cables are separately encased in tile duct embedded in the floor or basement wall.

Between the boiler room and turbine room is the pump room, 22 ft. wide and running the length of the building. It is open to the basement floor with the exception of a gallery along one side and the connection between the boiler and turbine rooms. This gallery supports two 2,500 h.p. Webster feed-water heaters, equipped with purifying, filtering and oil separator accessories, and working automatically. Other apparatus in the pump room includes a 1,500 gal. Blake underwriters' fire pump, two Marsh vacuum pumps for the heating system, and a hydraulic pump and accumulator to furnish water at a pressure of 1,500 lbs. per square inch to the hydraulic riveter in the boiler shop. The turbine room has a 15-ton, hand-operated crane, and the pump room a 5-ton hand crane.

The main source of water supply for the plant is three deep wells worked by Blake motor-driven, deep-well pumps having a capacity of 250,000 gals. each per 24 hours.

The superheated steam piping and the saturated steam piping form separate and distinct systems; the saturated steam being used for auxiliaries and the superheated steam for the turbines and compressors only. There is, however, a cross connection between the two headers for use in case of emergency. All steam leads from the boilers contain automatic stop and check valves and all steam leads to units, except those to pumps, contain receiver-type steam separators.

The sanitary question has been given careful attention. There will be two separate sewer systems, one sanitary in which the sewage will be purified in septic tanks and sand filters. The other system will care for the storm water which is to be discharged into large storage reservoirs. Each building will be equipped with full toilet facilities. The machine and erecting shop, for example, will have 56 water closets, 12 shower baths, 190 lavatories and 24 urinals in two toilet rooms on the balcony. There will also be eight urinals on the main floor located about 100 ft. apart on the columns between erecting and machine bays. Another feature of importance is 12 drinking fountains on the main floor, direct-connected to the deep wells already mentioned, which will supply pure cold water of even temperature the year through.

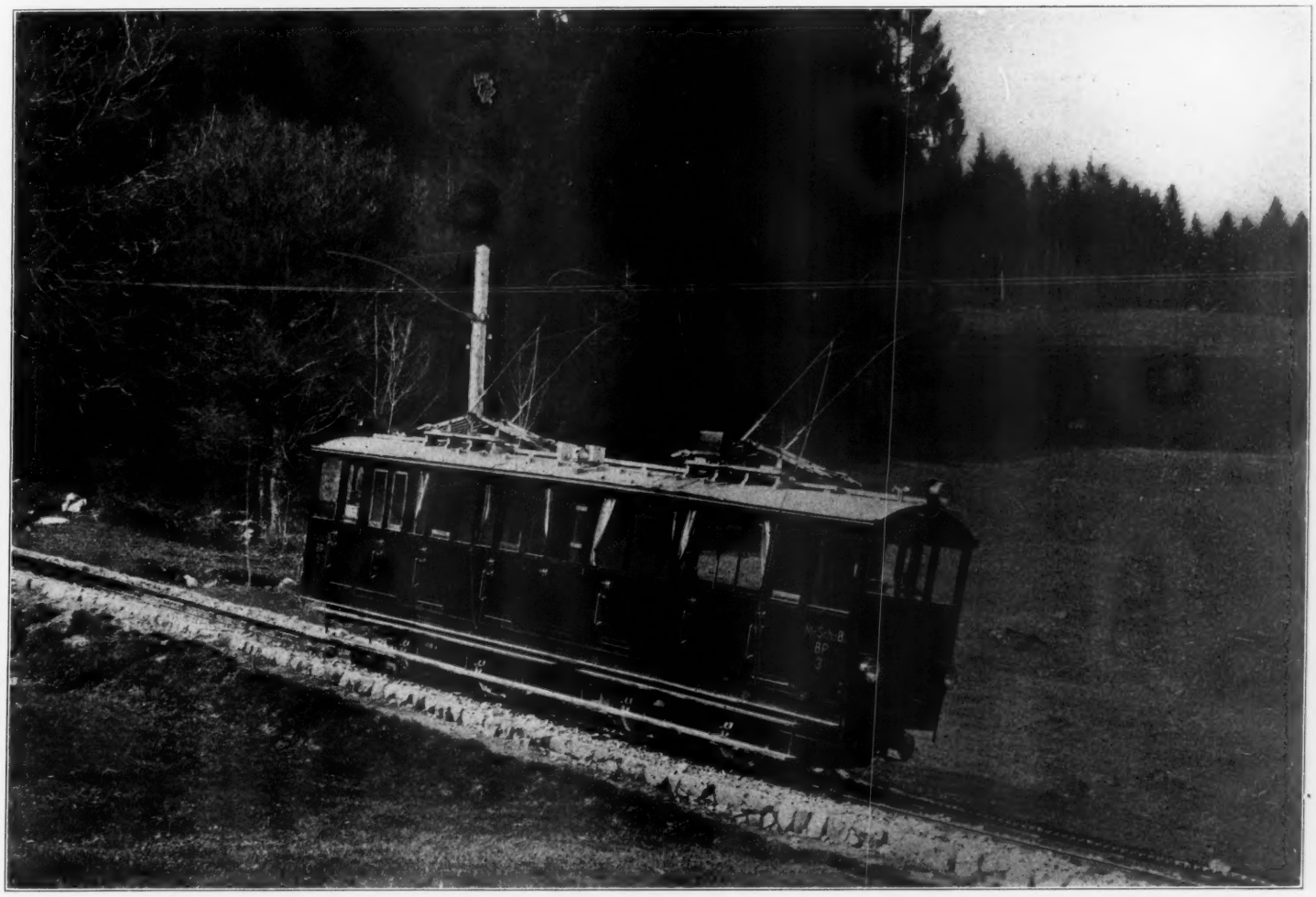
The five buildings here described are all of the locomotive department that will be built at present. They are estimated to be able to care for 1,000 locomotives a year—25 per cent. more than the present equipment of the road. The general plan of the shops indicates a 50 per cent. extension for all buildings, and for most of them there is room to double their length, so that the needs of the Big Four at Indianapolis are amply provided for for a long time to come.

The work has been under the constant supervision of W. Garstang, Superintendent of Motive Power of the Big Four, and B. D. Lockwood, Mechanical Engineer, and has the approval of J. F. Deems, General Superintendent of Motive Power of the New York Central Lines. The tool layout and equipment is directly in the hands of the motive power department, and will be treated in a subsequent article, after complete installation has been made.

The Münster-Schlucht Electric Railway.

BY E. OMMEGANCK.

The Münster-Schlucht electric railway, in Alsace, has been opened for traffic this year, and is interesting on account of the heavy grades encountered. The object of the railway is to establish communication between Stossmeier, Ampfersbach, Schmelzwasen and the town of Münster, and also in summer to convey tourists to the Schlucht, a locality also accessible from the French side by the existing Schlucht-Gérardmer railway. Schemes for building this railway have been long on foot, as two alternative projects were under consideration. One was entirely an adhesion railway, some nine miles long, with a maximum gradient of 8 per cent., while the other scheme contained a section with a gradient of 22 per cent. on which a rack rail was required, but the maximum gradient was 5.5 per cent. on the adhesion portion. The route in this case was shorter by more than two miles.



Car on Munster-Schlucht Electric Railway near Beginning of Rack.

Various local conditions and other considerations were in favor of the combined rack and adhesion scheme, which was accordingly decided upon.

The first one and three-quarter miles of the route out of Münster lies along the main road. The line then leaves the road, but rejoins it in about half a mile at the transforming station. From this point the road has been widened to accommodate the line, which continues in this fashion until the commencement of the rack section, nearly four miles from Münster. This portion has a maximum gradient of 22 per cent., and terminates at Altenberg, about one and a quarter miles further on. The final section, rather over a

mile long, follows the picturesque road to the Schlucht, in the direction of the French frontier. The total length of the line is about six and a half miles, of which about one and three-quarter miles is equipped with a rack. The station at Münster is at an altitude of 1,250 ft., and the line rises to 3,740 ft. at the Schlucht. Grooved tramway rails are used in the streets of Münster, and ordinary bullheaded rail for the rest of the line. The sleepers are partly of impregnated oak. The gage is one meter.

The rack is of what is known as the Strub construction, similar to that in use on the Jungfrau, Vesuvius, Brunnen-Morschach and Monthey-Champéry railways.

Like the running rail, it is mounted on iron chairs. The top of the rack is about 2 in. above the head of the running rails. The maximum pressure on the teeth of the rack is 3.5 tons, from each of the two wheels which engage with it. Tangential pressure on the rack is taken in the usual way by concrete blocks. The rails were laid in lengths of 34.5 ft., and the rack in lengths of 11.5 ft. There are in all seven stations on the railway. The generating station is at the end of the line at Münster. Two belt-driven, three-phase alternators capable of an output of 200 k.w., at 7,000 volts, 50 cycles, are provided, driven by horizontal steam engines.

Power is taken to the sub-station referred to above, by an overhead line, partly on the same poles as the trolley wire. Here there are two 100 k.w. motor generator sets, which supply continuous current at 750 volts to the trolley wire. A buffer battery of 390 cells of a capacity of 296 ampere-hours is used in parallel with these machines.

The overhead construction is partly of the span wire and partly of the bracket arm type. Two conductors are used, each 9 mm. in diameter. Owing to the position of the sub-station a feeder has not been thought necessary. The return is by the rails, which are bonded in the usual manner. The collectors on the cars are of the bow type. Two of these are carried on each car, both of which, of course, make contact with the two overhead wires.

The normal traffic in summer is nine trains per day, but a service every quarter of an hour both ways can be maintained on special occasions. In winter four or five trains per day suffice. Each train consists of a four-axled motor car, with usually one trailer. The motor car is provided with four motors of 85 h.p. each, two of which are for driving the running wheels in the usual manner, while the remaining two are permanently connected to the gearing which engages in the rack. All four motors are used on the rack section, so that the full 320 h.p. is available. This arrangement of two motors for the rack and two for the adhesion wheels has been developed by the Alioth Company, of Basle, under the Strub patents, and permits of the same rolling stock being used on the rack and adhesive portions of the line. On the adhesion section only the two motors are in use, and these drive the wheels through a single reduction gear in the ordinary way. The other two motors are not then in use. On the rack sections, however, all four motors are employed as just said. The rack motors work with a double reduction gear, and the adhesion motors are connected in series to run with a high torque at a low speed. All four motors are controlled by a single controller, which is interlocked, to prevent any wrong combination of connections being used. Series parallel control is employed, and reversing and braking positions are provided. The driver cabs are provided with ammeters for both motor circuit voltmeters, and the necessary fuses and circuit breakers, and a lightning arrestor equipment is installed on the roof. The carriages are heated and lighted electrically.

The motor car is provided with the following independent systems of brakes: (1) A mechanical hand-brake, acting through eight brake-shoes; (2) a band brake on the shaft of the motors driving on to the rack; (3) a rheostatic brake, and (4) an automatic brake which grips the sides of the rack when the speed exceeds six miles per hour down the steep grade. This form of brake is fitted to both trucks. The brakes can at any time be worked from either end of the car. In addition to these four brakes, the following safety devices should be noted. In order to prevent all possibility of derailment a pair of jaws are fitted under each truck surrounding the head of the rack rail, and a disc clutch is provided between the rack motors and their gearing, which permits of a certain amount of slip in the event of a sudden stoppage of the motor in a serious short circuit, so the enormous strain of a sudden jerk upon the rack is avoided and only a normal braking effect given.

Rack Construction; Munster-Schlucht Electric Railway.

The carriages are all of one class, and, as may be seen from the illustrations, are of the compartment type, with ordinary side doors. In the case of the motor cars one compartment is fitted with removable seats, so that it can be used for luggage if required. Each motor car weighs 25.5 tons, including passengers, and the fully loaded trailer weighs 6.5 tons, giving a total weight for the train of 32 tons. Each train contains accommodation for 72 passengers. The maximum speed on the level is 10.6 miles per hour, and on the steep portion 4.7 miles per hour. The total journey occupies about an hour. The main contractors were the Société d'Electricité Alioth, of Basle.

GENERAL NEWS SECTION

NOTES.

The Chicago, Milwaukee & St. Paul has made a reduction of 25 cents a day in the pay of the thousands of laborers working on the construction of its Pacific coast extension.

Following the imposition by a Canadian court of a fine of $25,000 for negligence causing an explosion in a freight car, the Michigan Central has canceled all rates on explosives destined to or from Canadian territory.

The Chicago & Alton, which some years ago turned all news agents off its trains, has now made a rule allowing rear brakemen to sell newspapers. They must ask not more than 1 cent above the regular price for a paper.

The Trunk Line Association has issued a new freight tariff on westbound merchandise imported from Europe, which goes into effect December 2. Many articles have been increased from 2 cents to 10 cents per 100 lbs. (New York to Chicago).

The Indiana State Railroad Commission has issued an order under which railroads will have to treat the crossings of interurban electric lines on the same basis as other crossings; at crossings not properly signaled and protected trains must come to a stop.

The second section of double steel tubes for the Detroit river tunnel was sunk on November 25, in a trench 40 ft. deep in the bed of the river, near the American shore. The sections are 262 ft. long. It is understood that no more sections will be sunk until spring.

The employees of the Nashville, Chattanooga & St. Louis have erected a monument to the late Major John W. Thomas, former President of the road, who died on February 12, 1906. The monument, a statue of Major Thomas, stands in Centennial park, Nashville, and it was dedicated on Sunday last.

A press despatch from Winnipeg says that the Canadian Pacific on November 25 put in effect a new freight tariff, making important increases in rates. The government had ordered the suspension of the tariff because of complaints which had been made against it, but on the 24th the suspending order was rescinded.

The Seaboard Air Line has issued an order forbidding the sale of liquor in its dining cars while in the state of North Carolina, except to passengers. Since the prohibitory laws of that state have become so strict there has been, it is said, a large demand for drinks from "crowds" at the stations where the through trains stop.

The Willamette valley, Ore., has marketed a prune crop valued at $1,500,000 this year. The packers shipped 7,000 tons, beginning about September 15, and 5,000 tons more were to go to market this month. The bulk of this crop went to the Atlantic seaboard, but heavy shipments were also sent to the Middle West, Canada, Europe and several carloads to London.

The Interstate Commerce Commission rules that where a passenger on a railroad is sick sufficiently to make travel dangerous to his health, a stop-over (including extension of time on limited ticket) may be granted; and not only to the sick person, but to one or more members of his family, if traveling with him. The same privilege may be granted to persons who are detained by an established quarantine.

Beginning December 1, the Detroit, Toledo & Ironton will run its through trains both freight and passenger, via Toledo, Ohio, instead of via Adrian, Mich., Tecumseh and Wauseon, Ohio. The three towns last named will be served by a branch from Napoleon, Ohio. The new route will be from Detroit, Mich., to Dundee, then over the Ann Arbor tracks to Toledo, and Wabash tracks to the D., T. & I. tracks again at Napoleon.

The new railroad commission of the state of Oklahoma has begun business with steam at full pressure. A number of complaints have already been received, and an order has been issued to the Fort Smith & Western to reduce passenger fares to 2 cents a mile. This road did not make the reduction on the establishment of the new state, as did most or all of the other lines. The names of the members of the new commission are given in the Elections column.

Governor Comer of Alabama has signed all the railroad regulation rate bills, and they become effective December 1. The Louisville & Nashville had declared that nothing would keep it from testing the laws in the Federal courts, but the reporters now think that the legislature in passing the penalty bills has caused the railroad to reconsider. The bills now signed include all the maximum rate bills, known as Group 8, and all the penalty measures. Some other bills signed prescribe procedure for taking appeals from the orders of the Railroad Commissioners; provide for litigation in the state courts on causes of action arising in other states; forbid common carriers charging more than the rates fixed by law, and give the Railroad Commission new authority and power.

In the Federal court at Salt Lake City, November 20, indictments were returned against the Union Pacific, the Oregon Short Line, the Union Pacific Coal Co., and officers of the several companies, charged with violation of the anti-trust law by combining to force out of business D. J. Sharp, a coal dealer of Salt Lake City. The complaint alleges that Sharp was "punished" because he reduced the price of coal. The indictments are said to have been made in place of some which were returned several months ago but which were found defective.

Press despatches from Chicago say that the Erie Railroad, on the first day of its $10 passenger rate from Chicago to New York, took 2,400 passengers out of that city, all carried on four trains. The rate is made only in connection with steamship tickets to Europe, and these hundreds of passengers consisted almost wholly of foreigners who are going to Europe to spend the winter at their old homes. The same despatch says that the Grand Trunk and the Wabash will make a $10 rate to meet that of the Erie.

The number of emigrants going from New York to Europe is now far greater than in any former autumn, most of the steamships having all their low-class accommodations engaged weeks before sailing.

The Appellate Division of the Supreme Court of New York, third department, by a vote of three to two has sustained the constitutionality of the law of 1905, empowering a state commission to fix the rates at which gas shall be sold. The decision is looked upon as sustaining the Public Service Commission law of 1907 as regards the fixing of rates by a body to which authority has been delegated by the legislature. The decision is by Judge Smith, concurred in by Judges Chester and Cochrane. Judges Kellogg and Sewall dissent. The law in question authorizes the gas commission, after hearing and investigation, to fix the price of gas "within the limits prescribed by law." The court holds that, having thus fixed limits, the legislature has delegated only an administrative power. The only "limit" named in the press despatches reporting this decision is that of reasonableness—on the one hand, to the public, and on the other hand, to the producer; but this, according to the court, is sufficient. These limits are fixed, not by statute, but by the common law; but this makes no difference.

Coal Companies Sell Cars.

The Fairmont Coal Company has sold 2,223 and the Somerset Coal Company 1,000 coal cars. The Baltimore & Ohio has bought 1,700 of the Fairmont cars, and the Cumberland & Pennsylvania takes the rest and all the cars sold by the Somerset Company. These coal companies are now on the same footing as other coal shippers in the Fairmont and Somerset regions.

Railroad Disaster at Barcelona, Spain.

A press despatch of November 25 reports the derailment of a train on a bridge at Barcelona, Spain, on that day, in which 12 persons were killed and 22 injured, the train falling into the river.

Brown's (?) Discipline.

Several notices of dismissal have been posted at Sayre by the superintendent of the Pennsylvania division of the Lehigh Valley, as follows:

A brakeman failed to properly secure cars on a grade and an accident resulted.

An engineman permitted water to get low in a boiler with the result that considerable damage was done to the engine.

A yard brakeman was intoxicated when he reported for duty.

A brakeman failed to carry out instructions received from conductor, and a derailment resulted.

A conductor failed to carry out instructions received from a yardmaster, resulting in damage to cars.

A yard conductor was intoxicated while on duty and refused to work.—*Exchange.*

Law for Little Malefactors.

Passenger Traffic Manager C. S. Fee, of the Southern Pacific, has issued a circular of instructions giving interpretations of the revised Interstate Commerce law. This circular deals with extensions of tickets, stop-overs, charges for excess baggage, charges for

children, redemption of tickets and many other subjects. Any parent or guardian who endeavors to take a child of 12 or over across a state line on a half-fare ticket is subject to both fine and imprisonment. The man who induces a station agent to check a few pounds in excess of the 150 lbs. allowed free of charge across a state line is apt to get himself and the baggageman in jail. The man who beats his way on the cars across a state line breaks enough laws to keep him in prison for the rest of his life. A lineman in the service of a telegraph company, if making an interstate trip to repair some line which carries railroad business, can ride free, but if he rides across a state border on private business, then he violates the law and is liable to be sent to jail.

Need of More Track in Alabama.

The following extracts are from a letter from General Manager H. E. McCormack, of the Pratt Consolidated Coal Co., Birmingham, Ala., to Milton H. Smith, President of the Louisville & Nashville.

The company with which I am connected has shipped to the general markets in the South, for several years, about one and three-quarter millions tons of coal a year. This tonnage is equal to something more than half the tonnage of the entire cotton crop of the country, and the coal is sold and delivered in eight states. Rates that enable us to compete with the mines in Kentucky, east Tennessee, Virginia, as well as the output of Pittsburgh, which comes down the Mississippi river, and that of West Virginia and Virginia which comes down the Atlantic coast out of Norfolk, Va., are so carefully adjusted that for the several years that I have personally seen to the marketing of our product, I have not asked the railroad people for a reduction in the rate of freight to a single point. On the contrary the present rates would admit several million tons of coal to be marketed in excess of that now being produced in Alabama. In other words, if we could produce the coal, and the railroads were in position to handle it, we could enlarge our market very greatly by pushing back the coal from the North and West in the sections where we now meet them.

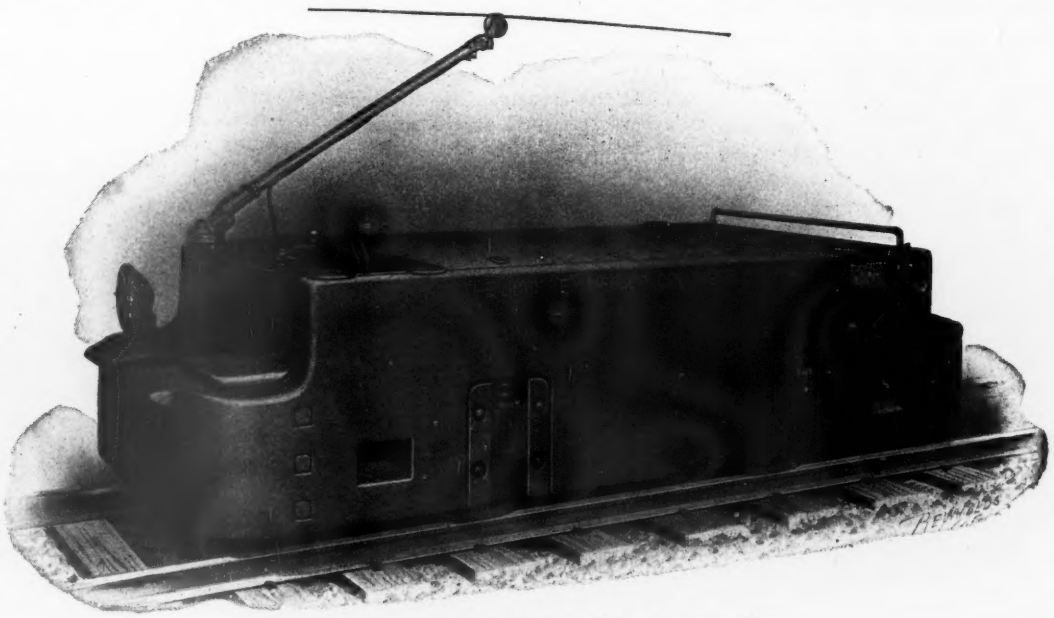
The Louisville & Nashville has always shown a friendly feeling to the Alabama coal field. Had it not been for you the rate to New Orleans would have been put, three years ago, to a point that would have virtually prohibited shipment of Alabama coal to that market, and thus deprived the mines of Alabama of a market for 2,000 tons daily, or 600,000 tons a year. I have been told that you informed the man who suggested it to you, that this advance in the rate of freight would shut down, or seriously injure, the mines along the line of the Louisville & Nashville in Alabama, and that you would, under no conditions, agree to the advance suggested.

I am unable to recall a single instance where a serious complaint has been made by our customers as to the rate of freight. I have come to the conclusion that practically all of the shortcomings of the Southern transportation lines are to be charged to two causes. Lack of funds is the principal one, lack of time is the other. At the beginning of the period of prosperity some of the Southern roads did not have the additional capital required to add to their equipment as fast as their necessities demanded it. My observation is that the railroad is just getting in shape to need money when it is graded, rails laid and operation commenced.

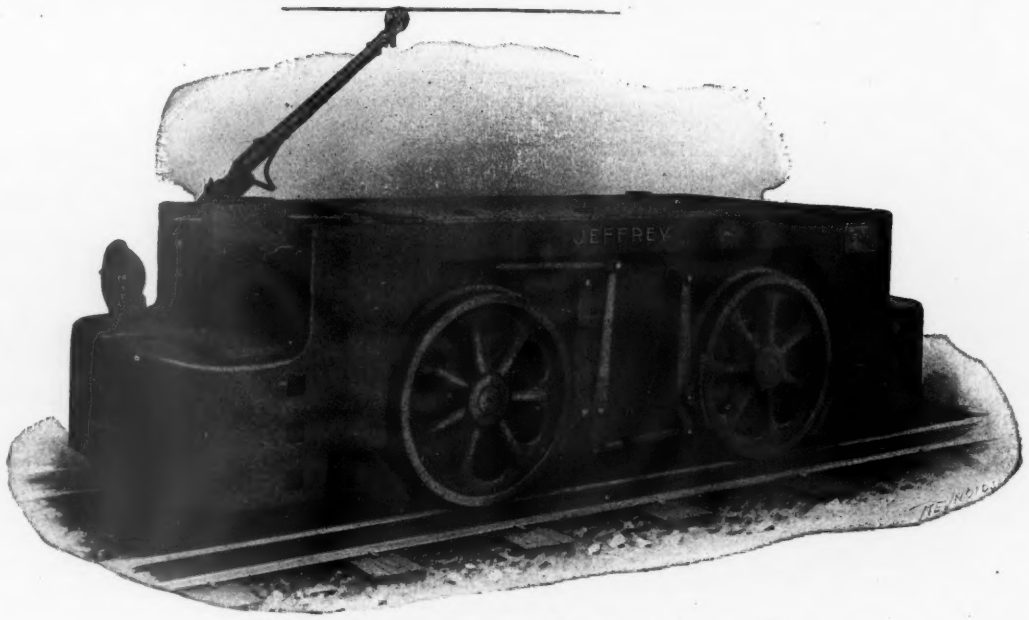
I have read that the Pennsylvania and the New York Central have spent for many years more money yearly in double-tracking, reductions of grades and curvatures than it cost to build their main lines originally. All the main lines in the Birmingham district move such a large tonnage that they will have to provide double tracks on which to move it. These cannot be built in a half century if it has to be paid out of earnings, and railroads cannot, of course, sell securities to the investing public unless they are able to show ability to earn interest on their bonded indebtedness, and a reasonable dividend above fixed charges. All of the main lines of the principal roads of Alabama were built hurriedly and by men whose capital was limited, and for that reason the double-tracking of our roads is a very much greater undertaking than is thought by most people. But if double-tracking is not done speedily, Birmingham and the mineral districts of Alabama will be brought to a standstill in so far as increased production is concerned.

Recent Types of Mine Locomotives.

The accompanying illustrations show recent types of electric mine locomotives built by The Jeffrey Manufacturing Co., Columbus, Ohio. The designs embody the latest ideas in mine locomotives and street railway construction. Every part has been made amply strong and is simplified as far as possible without losing any of the desirable features. The design is made to secure the smallest overall dimensions and at the same time allow access to all of the parts. The motors include the latest ideas in street railway practice, such as drum armatures with form-wound coils, laminated pole pieces, ribbon-wound field coils impregnated with solid compound, oil lubrication with auxiliary grease boxes and liberal wearing surfaces. The magnet frames are arranged so that the complete motor may be removed from the locomotive by taking off the axle caps, or the frame can be taken apart and the armature removed with very little trouble. The inside-wheel type is to be preferred where the mine entrance is wide enough to accommodate the increased width, as the wider locomotive allows more space for the electrical equipment and consequently easier access to the motors, rheostat, controller and other parts.



Inside-Wheel Type of Jeffrey Mine Locomotive.



Outside-Wheel Type of Jeffrey Mine Locomotive.

An Electric Switch Lock.

An electric device for locking and controlling outlying switches is shown in Figs. 1 and 2. This lock is connected to the switch point

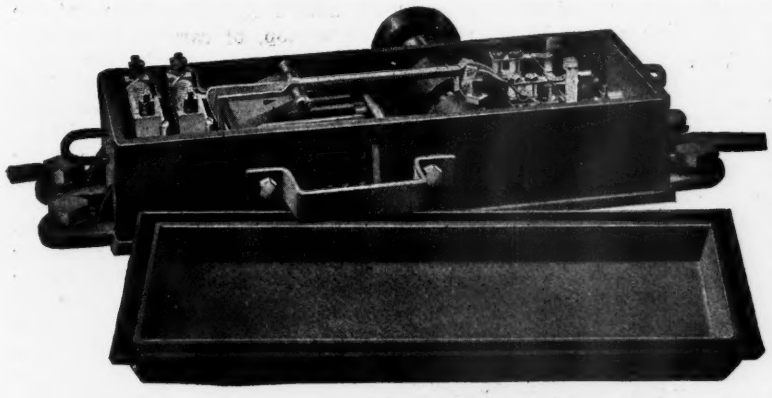


Fig. 1.

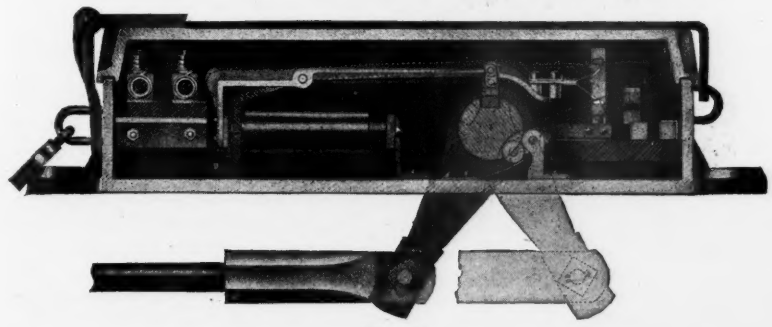


Fig. 2.

to make it impossible to throw the switch except with the co-operation of the nearest telegraph operator or towerman. The lock may be controlled at any reasonable distance from the switch. It is not necessary that the switch be in sight of the operator, as the lock is arranged with contact points so controlled as to indicate to the operator the exact position of the switch and the condition of the lock.

Fig. 1 shows the lock with the cover removed, and Fig. 2 is a sectional view. The locks are equipped with lightning arresters and two sets of contacts, one set being controlled by the movement of the switch point and the other by the lock mechanism. Visible or audible indications are given to the operator by these contacts and other circuits for electric signals may be opened or closed if need be. The contacts are either graphite or platinum. The use of these locks will save valuable time in train movements. A train may pull into a long siding and go to the far end, perhaps two or three miles distant, and there await permission from the tower operator to proceed to the main line. Trainmen cannot throw the switch and get on the main line without the towerman's co-operation.

A siding bell is placed at outlying switches for communication between same and interlocking towers or telegraph offices. Fig. 3 shows the signal bell box in combination with an indicator. The bell box contains the signal bell and keys for communicating between operator and trainmen. The indicator gives the trainmen the necessary stop or proceed signal. This is the device used in towers to give the switch lock operator indications of the switch movements. The siding bell is furthed either with or without the indicator.

These devices are made by the Railroad Supply Co., Chicago. Diagrams and circuits for electric lock applications will be furnished on request.

Fig. 3.

Muirhead's Station Indicator.

The Grand Central Station, New York City, has lately been equipped with new indicators, used to show the time and destination of departing trains, and one of the new pattern is shown in the illustration given herewith. Outwardly these indicators differ from the style formerly used chiefly in the use of white letters on a black ground instead of black letters on a white ground, but the mechanism by which the slats are turned has been simplified also. The slats bearing the station names are four-sided and three of the four sides are available for lettering, so that any one indicator will carry enough names to accommodate almost any train on any-one of the three roads leading out of this station—the New York Central, main line; the Harlem division of the same road, and the New York, New Haven & Hartford. Thus any train may be started from any track. Each slat is moved by a vertical rod reaching down to the bottom of the case and it is turned so as to show the proper name for a given train by pushing the rod upward. A portion of the rod is notched so that a rack-and-pinion movement is accomplished, with the minimum of friction. The selection of the proper rods to be pushed is made by means of a card, perforated with holes opposite those rods which are not to be lifted.

Muirhead's Station Indicator.

The necessary supply of cards for use in connection with the trains usually departing from a given track are kept in the bottom of the case for that track, and the closing of the bottom door, after the card has been adjusted, lifts all the desired rods at a single stroke. On some of the indicators as many as 70 stations may be shown at one time. The cylinder bearing the name of the road and the figures showing the time are put in position by the same movement which turns the slats, and at the end of the stroke the slats are locked and kept in perpendicular position. The opening of the door releases every part and shows blanks throughout. The names and descriptions of the different trains are on a cloth curtain operated with a small crank from the side of the indicator near the bottom. The indicators are from 3 ft. to 3½ ft. wide; from 8½ ft. to 9½ ft. high and 7 in. thick. They are made by W. R. Muirhead, Bridgeport, Conn.

Boston & Albany Improvements.

Four-tracking is now under way on the Boston & Albany from Lake Crossing, Mass., to South Framingham, five miles, and it is expected that it will be finished by the middle of next month. The

road will then have four tracks from Boston to South Framingham, 21 miles; traffic is particularly heavy on this section of the main line because of the connections at South Framingham with the Milford branch of the B. & A. and with the New York, New Haven & Hartford. Five miles of third track from the South Spencer yard to the Charlton yard are in use, but there is more work to be done on it. Repairs are under way in the Worcester yard. Enlarged repair shops are being built at West Springfield, and part of the shops are to be in use within a few days. When finished they will have capacity for 38 to 40 engines a week; the old shops handle only 12 to 14 locomotives a week. These improvements consist of extensions to the old shops, new buildings and a new coal trestle. Long passing sidings are being built near Huntington, Chester and Middlefield. A siding has been put in at South Framingham, and another will be built west of East Brookfield. Several miles of third track near North Adams Junction and also east of the New York-Massachusetts state line are being laid. An eight-stall engine house is being built at Pittsfield, to be finished by the end of next month. Work is also under way for the 40-stall Beacon Park engine house at Boston. Plans are being made for new signals, to cost about $900,000. Three-quarters of the road will have new signals, and the installation, which is to be started next spring, is to be finished in two or three years. Other improvements include: a coaling plant and water station at East Brookfield, a water station at Rochdale, remodeling of the water supply system at Chester and new stations at Brookview and Payn's Mills.

Mileage Books in New York.

At Albany, N. Y., November 25, the State Public Service Commission held a hearing on its proposal to regulate and extend the sale of its interchangeable mileage tickets. Most of the railroads of the state were represented, and some of them protested strongly against the use of mileage tickets. Mr. Fort, of the New York Central, said that the use of interchangeable books would necessitate a large increase in the clerical forces of the railroads. Mr. Wallace, of the Erie, said that to make mileage tickets interchangeable would unjustly reduce the revenue of his road, and there would be a general traffic in the books by storekeepers. Chairman Stevens of the commission said that the Erie had encouraged the sale of books to ticket scalpers, knowing that coupons would be sold to users at less than the regular rate.

Mr. Carr, of the Delaware & Hudson, said that as the mileage book was a discrimination, the universal enforcement of its use by law would compel the roads to sell all tickets at the mileage book rate, 2 cents a mile. Mr. Carr doubted the legality of the present practice of selling mileage books at less than the regular one-way fare. Mr. Lee, of the Lehigh Valley, declared that the railroads had gone far enough in the use of mileage books; he would like to see them wholly abolished.

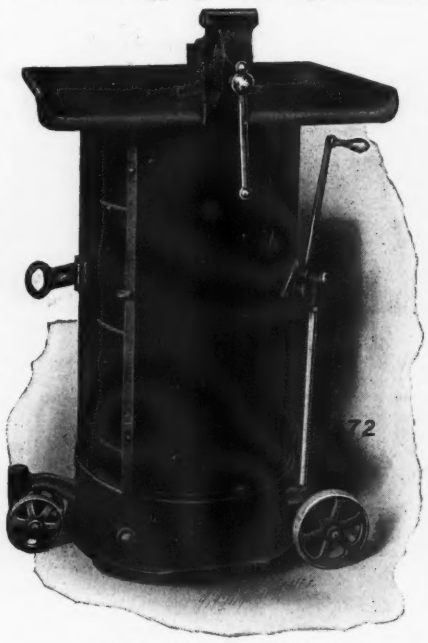
Vice-President Kerr, of the New York, Ontario & Western, told how his road had adopted a general 2-cent rate in 1898 in order to be able to abolish mileage books, because their use was a source of a great loss of revenue to the road. He considered mileage books the most vicious system of handling passenger transportation which has been introduced in railroad laws. Vice-President Caldwell, of the Lackawanna, agreed with Mr. Kerr that the mileage book was an abomination. Mr. Wood, of the Pennsylvania, said that the mileage book now in use on his road reduced the revenues $1,500,000 a year, as compared with the fares formerly paid by the users of the mileage books. The Commercial Travelers' Association was represented by Daniel Gray and George W. Driscoll. They did not ask for discrimination, but wanted a low mileage ticket rate for all. Mr. Driscoll said that he should come later and ask for a general 2-cent rate for everybody.

Profitable Electric Railway in Korea.

The American-Korean Electric Company operates at Seoul the only street railway in Korea. The average number of passengers carried daily in 1904 was 11,442; in 1905, 12,963; and in 1906, 13,714. The car mileage was 145,110 miles in 1904 (five months), 326,793 in 1905, and 398,616 in 1906. The equipment included 37 passenger and 18 freight cars. The company operates 12 miles of tracks with overhead electrical equipment. The gross receipts in 1906 were $98,221 and the net earnings $25,324, the increase in net earnings in 1906 over 1905 being 48 per cent. The company announces that the operating expenses have been reduced from 80 per cent. of the receipts in 1905 to 74 per cent. in 1906, but with the decrease in the cost of coal and with an increased service without addition to the expense of management it is hoped that a further material reduction will occur in 1907. With the exception of an injury to a boy, who fell under the car while stealing a ride, no accidents occurred during 1906, and the efficiency of the Korean motormen and conductors is becoming more and more apparent. A reward, in the nature of a bonus, is paid by the company at the end of each month in which no accidents occur.—*Consular Report.*

A Portable Vise Stand.

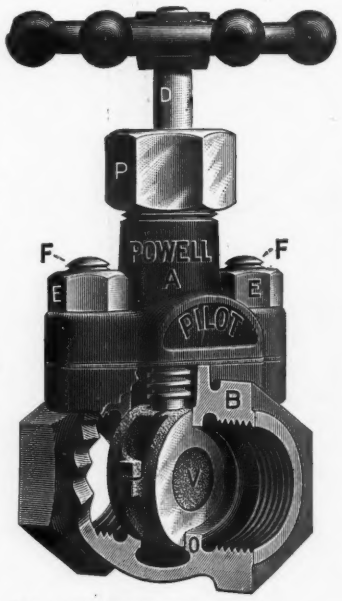
The accompanying illustration shows a portable vise stand made by the New Britain Machine Co., New Britain, Conn. The circular column of rolled boiler plate, firmly held between the base and the top, makes a rigid support for the vise, and withstands hammer blows in chipping. The top, of cast-iron, is so shaped that tools or work may be laid upon it, and in moving from place to place they will not jar off. The interior of the column is provided with three beaded edge shelves, two of which are adjustable, for holding or storing tools, and the sliding door with hasp closes the column. This door sets into jambs, travels in slides top and bottom, and can be padlocked. The position of the door is such that it is easy to open it without moving from working position; also, the column is not weakened under the vise. The base, of cast-iron, gives ample spread for floor support, and on the vise side is far enough back from the working line so that in standing at the vise nothing is in the way of the workman's feet. To move the bench from one palce to another, is is necessary only to raise the self-locking handle to the position shown in the cut which lifts the stand from the floor and throws the weight on the three wheels, two of which are dead and one swiveled. The stand can then be easily pushed over rough or smooth floors, the swiveled wheel trailing. The stand is built in two sizes, one in which the top tray is 20 in. x 26 in., carrying a 3½-in. vise, and another in which the top tray is 24 in. x 32 in., carrying a 5-in. vise. In each case, the vise is the right height for filing 41 in. They are usually equipped with a standard make of vise, but special vises can be provided or the stands can be furnished without vise, where it is to be used as an inspector's cabinet.



A Portable Vise Stand.

The "Pilot" Gate Valve.

The William Powell Co., Cincinnati, Ohio, has added the "Pilot" iron-body gate valve to its steam specialties. This valve is strongly and compactly built. The iron body, as shown in the illustration, has heavy lugs on each side of the neck, carrying stud bolts, F, and the bonnet cap, A, has corresponding lugs drilled to template to insure a perfect joint and constant alinement; this also allows the bonnet to be replaced without unusual care after taking apart for inspection or repairs. Two semi-finished hexagonal nuts, E, large enough to allow wrenching down hard, with a joint of good packing material between the faces of bonnet and body, make a tight joint for all pressures up to 100 lbs. The large brass packing nut, P, affords plenty of room for packing around the stem. The brass stem and bonnet are chased and cut to a true "Acme" thread of unusual length. This length of thread keeps the stem in a true axial position at all times whether open or closed. The hand wheel gives a firm grip, even with oily hands.



The "Pilot" Gate Valve.

The discs are double with ball and socket back, making them adjustable. They are hung in recesses to the collar on the bottom of the stem. The discs, working in a tapering seat, expand or collapse in opening or closing, so that the valve can be closed down tight without straining, or opened easily under all conditions. This valve is also made of all iron, that is, discs, stem and packing nut are iron, no brass being used at all. This iron valve is intended for use with ammonia, cyanide solutions, acids and other liquids or gases that attack brass.

The Battery Tunnel.

The second railroad tunnel under the East river, New York City, between Manhattan and Brooklyn, is now completed sufficiently to permit the running of cars, and a train carrying a party of guests was run on November 27 from Wall Street station in Manhattan to the Borough Hall in Brooklyn. This tunnel forms an eastward extension from the south end of the present subway in Manhattan.

MANUFACTURING AND BUSINESS.

The Rail-Joint Company, New York, has equipped the Panama Railroad with base supporting rail-joints.

The Railway Board, Calcutta, India, is asking bids until January 6, 1908, for 60.000 wooden ties for the Oudh and Rohilkhand Railway, delivery to begin April 15 and to be finished by June 30, 1908.

The Central Inspection Bureau, New York, have a contract with the American Railways Co. for the inspection of a number of single-truck cars to be built at the Kuhlman plant, Cleveland, Ohio, of the J. G. Brill Co., Philadelphia, Pa.

The American Creosoting Co. has just begun operating its new plant lately built at Springfield, Mo., at a cost of $200,000. About 75 men are employed. The company will treat ties for the St. Louis & San Francisco. More than 500,000 ties are already on the ground.

W. A. Cornelius, Superintendent of the Monongahela furnaces of the National Tube Co., at McKeesport, Pa., has been appointed General Manager of the National Tube Co., succeeding George G. Crawford, who was recently made President of the Tennessee Coal, Iron & Railroad Co.

The Ball & Wood Co., Elizabethport, N. J., makers of engines, has added to its business a line of air compressors. Features of the design are: Large bearings and wearing surfaces, rigid frames, effective lubrication, ample valve areas and intercooling capacities, and high efficiency due to compactness of the engine.

The Expanded Metal & Corrugated Bar Co., St. Louis, Mo., has been awarded the gold medal by the jury of awards of the Jamestown Exposition for the Johnson corrugated steel bar. This is the fourth gold medal awarded to the corrugated bar, the last previous one having been given at the International Exhibition of New Zealand.

James H. Baker has resigned as President and General Manager of the Solid Steel Tool & Forge Co., Brackenridge, Pa., to establish an independent office in Pittsburgh. Mr. Baker has had a wide experience in the manufacture of drop forgings and will devote himself in future to the development of forging machinery and forgings, including car wheels.

The contract for the concrete pile foundations of the new conduit in the North Shore yard of the Long Island at Long Island City, N. Y., has been awarded to the Raymond Concrete Pile Co., of Chicago and New York. The conduit, which will be of concrete, will be 1,100 ft. long and will carry electric feed wires. The Abbott-Gamble Company, New York, has the contract for the conduit.

The National Foundry Co., Erie, Pa., recently made 275 molds from an 18-ton heat. Although some of these castings weighed only about two pounds, the average was about 60 lbs., there being 583 pieces in the heat. It took 1 hr. 35 min. to pour this heat, and most of the castings in it were about ½ in. thick. It is the usual practice of the company to pour 200 molds or more from each heat. It was a 25-ton acid open-hearth furnace.

The American Blower Co., Detroit, Mich., has received the following orders: Heating apparatus for the Oswego and Rensselaer roundhouses and Depew boiler shop, New York Central & Hudson River, and for the Washington, Baltimore & Annapolis Electric at Odenton, Md.; large pressure blowers for the Grand Trunk at Stratford, Ont., and for the Duluth & Iron Range at Two Harbors, Minn.; a special blower for the Dominion Car & Foundry Co. at Montreal, Que., and a three-compartment lumber dry kiln for the General Electric Co. at Schenectady, N. Y.

The Technical Publicity Association held its November meeting on the evening of the 21st in New York and listened to an address on "The Evolution of Fine Printing and its Influence on Advertising Literature," by Paul Pfizenmayer. Among the companies represented by those present were: A. Allen & Son, New York; Yale & Towne Manufacturing Co., New York; Lidgerwood Manufacturing Co., New York; Sprague Electric Company, New York; General Electric Company, Schenectady, N. Y.; R. R. Almond Manufacturing Co., Brooklyn, N. Y.; Crocker-Wheeler Co., Ampere, N. J.; American Locomotive Co., New York; Goldschmidt Thermit Company, New York; A. S. Cameron Steam Pump Works, New York; Crane Co., Chicago, Ill.; International Silver Co., Meriden, Conn.; Traylor Iron & Steel Co., High Bridge, N. J.; Standard Roller Bearing Co., Philadelphia, Pa., and J. G. Brill Co., Philadelphia, Pa.

Iron and Steel.

The 6,500 tons of rails ordered from the Russo-Belge rail mill at Odessa for the Cananea, Yaqui River & Pacific, the Mexican line of the Southern Pacific, are now afloat, to be landed at Tampico, Mexico. The route is through the Black sea, the Dardanelles, the Mediterranean, and across the Atlantic and the Gulf of Mexico to Tampico, some 6,700 miles.

OBITUARY NOTICES.

Storm Bull, Mem. Am. Soc. Mech. Engrs., Professor of Steam Engineering at the University of Wisconsin, died on November 19 at his home in Madison, Wis.

Corwin V. Howell, General Claim Agent and Attorney at Chicago for the Pennsylvania Lines West of Pittsburgh, died on November 20 of Bright's disease. He was 59 years old and had been with the Pennsylvania Lines since 1889. Before coming to the Pennsylvania, he was with the Canadian Pacific as claim agent of the Western division. He was buried at Chicago.

Michael Gilleas, formerly Third Vice-President of the Yazoo & Mississippi Valley, died last Monday at Los Angeles, Cal. Mr. Gilleas was 63 years old and all his railroad work was done on Illinois Central lines. He was born in Ireland and when he was 15 years old began work as a porter in the Superintendent's office at Amboy, Ill. He spent two years in a freight office and then, until 1877, was in the office of different Division Engineers. He was then appointed roadmaster of the Iowa division and in 1883 was made Superintendent of that division. Four years later he was appointed Superintendent of all lines in Iowa and in 1891 was made Superintendent of all lines west of Chicago. The next year he was appointed General Superintendent of the Yazoo & Mississippi Valley. In 1893 he was made Assistant General Superintendent of the Y. & M. and the southern lines of the Illinois Central, giving him authority over all lines south of the Ohio river. In 1902 he was elected Third Vice-President and General Superintendent of the Y. & M. V., and from November, 1905, until his retirement at the end of 1906, was Third Vice-President of the company.

Edward A. Handy, General Manager of the Lake Shore & Michigan Southern, died at Chicago on November 21 of pneumonia, after only three days' illness. Mr. Handy was born in Massachusetts in 1855 and educated at the Massachusetts Institute of Technology. His railroad work began in 1878, when he started as an assistant engineer of construction on the Atchison, Topeka & Santa Fe. After a year he was made Assistant Engineer of Bridges and Buildings and in 1880 went to the Mexican National, now the National of Mexico, as locating engineer. He was made Principal Assistant Engineer of the Northern division of that road in 1881 and two years later was appointed Chief Engineer. In 1888 he went to the Lake Shore as Engineer of the Lake Shore division. He was made Chief Engineer of the road in 1891. He held this office for 14 years and then, in 1905, was made Assistant General Manager, remaining in particular charge of engineering work. He was made General Manager when W. H. Marshall left the road last year to become President of the American Locomotive Company.

E. A. Handy.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Atlantic Coast Line.—W. W. Mackall, Savannah, Ga., has been elected a Director, succeeding Col. J. H. Estill, Richmond, Va., deceased.

Chicago & Alton.—S. M. Felton, President, has resigned. T. P. Shonts, Chairman of the Executive Committee of the C. & A. and President of the Toledo, St. Louis & Western, is to succeed Mr. Felton; a meeting of the Board of Directors is to be held in a few days. See Mexican Central.

Lehigh Valley.—J. W. Robbins, transfer clerk in the Secretary's office, has been appointed Assistant Secretary.

Mexican Central.—S. M. Felton, President of the Chicago & Alton, has been elected President of the Mexican Central, succeeding A. A. Robinson, who resigned a year ago. Eben Richards, who has been acting in Mr. Robinson's place, resumes his former office of Vice-President and General Counsel.

Missouri Pacific.—J. M. Johnson, Assistant to Vice-President C. S. Clarke, has been elected Vice-President in charge of traffic of this road and of the St. Louis, Iron Mountain & Southern. E. M. Boyd succeeds Mr. Johnson.

Pennsylvania Lines West.—C. G. Johnston has been appointed General Claim Agent and Attorney at Chicago, succeeding C. V. Howell, deceased. Mr. Johnston was assistant to Mr. Howell.

St. Louis, Iron Mountain & Southern.—See Missouri Pacific.

Operating Officers.

Boston & Albany.—J. H. Relyea, night chief train despatcher of the Albany division, has been appointed Trainmaster of that division, with office at Springfield, Mass., succeeding J. L. Truden, promoted. W. D. Anderson has been appointed Trainmaster, reporting to the Superintendents of the Boston division and of the Albany division. W. H. Brown has been appointed Trainmaster of the Boston division.

Canadian Pacific.—A. Price, General Superintendent at Winnipeg, Man., has been appointed General Superintendent at Calgary, Alb., succeeding R. R. Jamieson, who takes Mr. Price's place at Winnipeg.

Cincinnati, New Orleans & Texas Pacific.—W. E. Wheelock, Trainmaster at Somerset, Ky., has been appointed Superintendent of Terminals at Chattanooga, Tenn.

Mexican International.—W. F. Sheridan, Superintendent of Transportation, has resigned and the office has been abolished.

Mobile & Ohio.—H. W. Clarke, Superintendent of Transportation, has resigned, effective December 31.

St. Louis, Brownsville & Mexico.—E. L. Burke has been appointed Superintendent of the Second and Third divisions, with office at Kingsville, Tex., succeeding Oliver Rowe, effective December 1.

Southern.—E. H. Coapman, General Superintendent at Danville, Va., has been appointed Manager of the Northern and Eastern districts, with office at Washington, D. C., succeeding J. W. Seale, deceased. A. H. Westfall, Superintendent at Atlanta, Ga., succeeds Mr. Coapman. E. E. Norris, Superintendent at Knoxville, Tenn., succeeds Mr. Westfall. W. M. Deuel, Superintendent of Terminals at Atlanta, Ga., succeeds Mr. Norris.

Traffic Officers.

Chicago, Rock Island & Pacific.—See Missouri Pacific.

Missouri Pacific.—B. M. Flippin, Assistant Freight Traffic Manager, has been appointed Freight Traffic Manager of this road and of the St. Louis, Iron Mountain & Southern, succeeding W. C. Smith, resigned. The office of W. B. Knight, Assistant Freight Traffic Manager, has been moved from Kansas City, Mo., to St. Louis. He will be hereafter in charge of rates, divisions and publication of tariffs. K. M. Wharry, Assistant General Freight Agent of the Chicago, Rock Island & Pacific at Kansas City, has been appointed General Freight Agent of the Missouri Pacific, in charge of freight traffic in Kansas, Nebraska and Colorado, including Kansas City and St. Joseph, Mo. His office is in Kansas City. J. P. Burnett, Assistant General Freight Agent at St. Louis, has been appointed General Freight Agent in charge of the St. L., I. M. & S., with office at St. Louis. R. H. Eggsbrocht succeeds Mr. Burnett. J. N. Githens, General Agent at Chicago, Ill., has been appointed General Freight Agent of the Missouri Pacific in charge of solicitation at St Louis. See this company under executive, financial and legal officers. The office of D. R. Lincoln, Assistant General Freight Agent, has been moved from St. Louis to Kansas City.

Oklahoma Railroad Commission.—The Commissioners are as follows: John Love, Chairman, of Woodward; J. J. McAllester, of McAllester, and A. P. Watson, of Shawnee. W. L. Chapman, of Pawnee, Secretary of the Democratic State Committee and Editor of the *Shawnee Daily Herald*, is Secretary of the Commission. Mr. Love serves for six years, Mr. McAllester for four years and Mr. Watson for two years.

St. Louis, Iron Mountain & Southern.—See Missouri Pacific.

Wabash.—H. H. Taylor, traveling freight agent, with headquarters at Toledo, Ohio, has been appointed General Agent at Danville, Ill.

Engineering and Rolling Stock Officers.

Lake Erie, Alliance & Wheeling.—See Lake Shore & Michigan Southern.

Lake Erie & Western.—See Lake Shore & Michigan Southern.

Lake Shore & Michigan Southern.—J. W. Senger has been appointed Supervisor of Material, with office at Collinwood, Ohio, of this company and of the Lake Erie & Western and the Lake Erie, Alliance & Wheeling.

Purchasing Agents.

Chicago, Rock Island & Pacific.—J. M. McCarthy has been appointed Purchasing Agent. The office of General Purchasing Agent, formerly held by F. P. Jeffries, who has resigned, has been abolished.

CAR BUILDING.

The Baltimore & Ohio is in the market for one postal car.

The Baltimore & Ohio is said to be in the market for cars.

The Atlanta & West Point is in the market for one passenger car.

The Agar Packing Company, Des Moines, Iowa, is figuring on about 25 refrigerator cars.

The Pere Marquette denies having asked bids on 1,000 box cars, as reported in the *Railroad Gazette* of November 22.

Virginian Railway denies that it is in the market for eight special cars as reported in the *Railroad Gazette* of Nov. 22.

The Boston & Maine is said to have ordered 25 passenger cars from either the Pullman Company or the Laconia Car Company.

The Detroit, Toledo & Ironton denies having asked bids for box and flat cars as reported in our advance sheet of November 16.

The Chicago, Indianapolis & Louisville denies that it has asked bids on several hundred box and gondola cars, as reported in our advance sheet of November 16.

The Tonopah & Goldfield denies having ordered four chair cars, one smoking car and one baggage car from the Pullman Company, as reported in the *Railroad Gazette* of November 8.

The Duluth, Missabe & Northern, as reported in the *Railroad Gazette* of November 8, is about to order 19 passenger cars. Contracts for specialties for these cars are now being closed.

The Duluth, South Shore & Atlantic is in the market for three second class passenger coaches, 67 ft. 6 in. long; one first class passenger coach, 52 ft. 5 in. long, and one baggage car 52 ft. 5 in. long.

The Philippine Railways, as reported in the *Railroad Gazette* of November 8, have bought, through J. G. White & Co., four combination parlor and first class passenger cars. The special equipment, in addition to that formerly reported, includes: Congdon or Diamond S brake-shoes, natural varnish finish inside and out, Walkover chairs in the parlor compartment and triple elliptic springs.

The San Antonio & Aransas Pass, as reported in the *Railroad Gazette* of October 25, is asking prices on 200 ventilated cars and 275 plain box cars of 60,000 lbs. capacity. These cars will measure 36 ft. long, 8 ft. 6 in. wide and 12 ft. 9¼ in. high, over all measurements. The special equipment includes:

Brakes	Westinghouse
Brake-shoes	Christy
Brasses	More-Jones
Couplers	Janney
Door fastenings	Security
Draft rigging	Farlow
Journal boxes	McCord, Symington or Franklin
Paint	Sherwin-Williams
Roofs	Murphy
Springs	Standard Steel Works

The Intercolonial has ordered 130 hopper cars of 30,000 lbs. capacity from Rhodes, Curry & Co., and 70 Hart convertible cars of 80,000 lbs. capacity from Rhodes, Curry & Co., to be built by the Dominion Dump Car Co., at Montreal. The hopper cars will weigh 20,000 lbs. and will measure 15 ft. 10½ in. long and 8 ft. 3 in. wide, inside measurements, and 16 ft. 10 in. long, 8 ft. 8 in. wide and 9 ft. 5 in. high, over all. The Hart convertible cars will weigh 37,000 lbs., and will measure 32 ft. 2 in. long, 8 ft. 8 in. wide and 5 ft. ¼ in. high, inside measurements, and 34 ft. long, 9 ft. 10 in. wide and 9 ft. 3½ in. high, over all. The bodies and underframes of all cars will be of wood. The special equipment for all cars includes:

Bolsters (for Hart convertible cars)	Simplex
Brake-beams	Simplex
Brake-shoes (for hopper cars)	Christy
Brakes	Westinghouse
Draft rigging	Miner Tandem
Dust guards (for hopper cars)	Harrison
Paint	Red oxide
Springs	Coil
Trucks (for Hart convertible cars)	Simplex
Wheels	Cast iron

RAILROAD STRUCTURES.

Coburg, Ore.—The Southern Pacific, it is said, has resumed work on the new steel bridge over the McKenzie river, near this place, on the Woodburn-Natron branch.

DENVER, COLO.—The Chicago, Burlington & Quincy, the Chicago, Rock Island & Pacific, and the Atchison, Topeka & Santa Fe, according to local report, are jointly planning to build a union passenger station here.

EDMONTON, ALB.—The Canadian Northern, it is said, will put up shops here next spring, to employ 200 men.

EVANSVILLE. IND.—The East Princeton & Vincennes Construction Co. will establish its power plant and headquarters here.

FORT SMITH, ARK.—The Kansas City Southern has recently bought ground for freight terminals within a block of the business center of this city. The present freight station is too far out to enable this company to obtain its share of business. Plans for a brick freight house, 40 ft. x 250 ft. have been recently revised, and bids for the work will soon be asked for.

KANSAS CITY, KAN.—It has been announced that at a recent meeting of the directors of the Kansas City Terminal Railway Co. in Chicago, it was decided to build a union station and passenger tracks to serve same in Kansas City, Kan., in connection with the proposed union station which is to be erected in Kansas City, Mo. Actual work will be held in abeyance until a more favorable time for financing the project.

KANSAS CITY, MO.—The Kansas City Southern is making plans for a new inbound and outbound freight house soon to be built on the old Union Elevator property in the west bottoms. The building will consist of a two-story brick structure for office purposes, and a one-story freight warehouse. The dimensions over all will be 40 ft. x 500 ft.

MINNEAPOLIS, MINN.—The Minneapolis, St. Paul & Sault Ste. Marie has started work on additions to its shops here. The cost of the improvements will be about $200,000.

TAMPICO, MEX.—The Mexican Central has adopted plans for important harbor improvements at this place. The plans will have to be approved by the Federal Government before the work will be begun.

TOLEDO, OHIO.—The Board of Public Service has approved the plans of the Lake Shore & Michigan Southern for its proposed steel bridge over the mouth of Swan creek, from the foot of Monroe street to Goose Point. (Oct. 11, p. 434.)

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ATLANTA, BIRMINGHAM & ATLANTIC.—Plans are being made by this company to begin running regular trains January 1 on the Atlanta branch from Chalybeate, Ala., north to Atlanta, 77 miles. (Oct. 18, p. 472.)

BALTIMORE & OHIO.—This company, it is said, will lay additional sidings along its Pittsburgh & Western division to the Ohio state line, in addition to the work now under way straightening the line.

CHICAGO, MILWAUKEE & ST. PAUL.—It is reported that this company has opened its Pacific extension from Mobridge, S. Dak., west to Bowman, N. Dak., 200 miles from the Missouri river. (Oct. 25, p. 509.)

CINCINNATI, BLUFFTON & CHICAGO.—This company is pushing work on the remaining 15 miles of the line it is building from Bluffton, Ind., northwest to Huntington. A bonus of $98,000, it is said, is to be given by residents of Huntington if the line is in operation to that place by January 1, 1908. The road is now in operation from Bluffton southeast to Portland, 30 miles, and is eventually to be extended south from Portland to Union City, thence east to Versailles, Ohio, 35 miles. The company has bought land in Huntington on which it will put up shops, to cost about $75,000. (March 15, p. 382.)

COLUMBUS, MAGNETIC SPRINGS & NORTHERN (ELECTRIC).—This company, operating an electric line from Delaware, Ohio, northwest to Richwood, 18 miles, is building an extension north to Larue, 13 miles.

DULUTH & THUNDER BAY.—See Minneapolis, St. Paul & Sault Ste. Marie.

EDMONTON, DUNVEGAN & BRITISH COLUMBIA.—Application will be made by this company for an extension of time to build its proposed line from Edmonton, Alb., to Fort George, B. C. Pringle & Guthrie, solicitors. (Mar. 15, p. 395.)

GRAND TRUNK PACIFIC.—Grading on the main line has been finished from Portage la Prairie, Man., west toward Saskatoon for 412 miles, and track has been laid for about three-fourths of this distance. Work is being pushed to finish the line to Saskatoon. About 60 per cent. of the 318 miles from Saskatoon to Edmonton is also graded.

Surveyors are active now on both sides of the Yellowhead Pass, as the company desires to ask for grading bids early next spring.

ILLINOIS CENTRAL.—This company expects to begin running regular trains on its Birmingham line about the first of January. (Oct. 4, p. 403.)

ILLINOIS ROADS (ELECTRIC).—Rights-of-way are being secured by President Patton, of Charleston, for the proposed Mattoon-Hillsboro electric line. Application will be made for franchises through the towns along the proposed route from Mattoon west via Shelbyville, Tower Hill and Pana to Hillsboro, about 60 miles.

KANSAS CITY SOUTHERN.—Work is in progress on a three-mile cut-off on this road just south of Howe, Okla., where this line is crossed by the Rock Island. The new line is to have a maximum grade of five-tenths of 1 per cent., and is a part of the plan for the contemplated reduction of the grade on this road, extensive surveys for which were made during the past year.

KETTLE VALLEY LINES.—Rights-of-way have been secured and work, it is said, will be started about February 1, by this company on its proposed extension from Spokane, Wash., northwest to Republic, 145 miles. (Mar. 15, p. 396.)

LAKE ERIE, ALLIANCE & WHEELING.—See Lake Shore & Michigan Southern.

LAKE SHORE & MICHIGAN SOUTHERN.—It is officially announced that on December 1 the Lake Erie, Alliance & Wheeling will be opened to Dillonvale, Pa., five miles south of Piney Fork, its present southern terminus. The line may eventually be extended south to Wheeling, W. Va., 17 miles.

LIGONIER VALLEY.—Plans are being made for extending this road from the new coal town of Wilpen, Pa., in Ligonier township, northwest to New Florence on the Pennsylvania Railroad about 12 miles. Surveys made. A branch has been built from Ligonier to Wilpen.

MARIETTA-MACLAND.—Application will be made by a company under this name for incorporation in Georgia with a capital of $500,000. The company, it is said, has options on the right-of-way for a railroad from Marietta, Ga., southwest ten miles to Powder Springs. J. N. McEachern and other Atlanta capitalists; also E. P. Dolls, J. P. Cheney, W. J. Manning, J. M. McEhreth and R. R. Petrie are interested.

MEADVILLE & CONNEAUT LAKE TRACTION.—Superintendent Kellenbaugh is quoted as saying that this company will build an electric line from Linesville, Pa., south to Greenville, 21 miles, if the Mahoning & Shenango Railway & Light Company will extend its line from Sharpsville, north to Greenville, 11 miles, to complete a through line from Youngstown, Ohio, to Greenville.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—This company, it is said, will build under the name of the Duluth & Thunder Bay, a new line from its proposed Duluth line northeast to a connection with the Canadian Pacific at Fort William, Ont., about 200 miles. About half the distance is now covered by logging roads which will be used as parts of the through line. The line to Duluth is to run from Brooten, Minn., northeast via Freeport, Royalton and Superior, Wis., to Duluth, 300 miles.

PENNSYLVANIA.—Plans, it is said, are being made by this company to begin double-track work next year on the Belvidere division from Trenton, N. J., north to Manunka Chunk.

RIO GRANDE, SIERRA MADRE & PACIFIC.—Work on the extension of this road toward the Pacific coast, it is said, has been suspended, on account of the financial stringency. Grading has been finished from Nueva Casas Grandes to a point about 25 miles south of that place and rails are on the ground. A bridge has also been built over the Guerrero river. It is understood that the Government will grant an extension of time in which to finish the line. The projected route is from Nueva Casas Grandes, Chihuahua, southwest via Santa Elena and Ocampo to a point on the Pacific coast either at Guaymas or at Topolobampo, 300 miles. (Oct. 4, p. 403.)

SOUTH & WESTERN.—President Carter, of this company, has announced that this line, which is under construction from Elkhorn, Ky., south to Bostic and south of that place, under the name of the Spartanburg & Northern to Spartanburg, S. C., a total of about 300 miles, is to be extended. Plans are being made to build from Spartanburg southeast to a point on the Atlantic sea coast early next year, 250 miles. (Nov. 8, p. 573.)

SOUTHERN PACIFIC.—This company, it is said, will shortly begin laying double track on its line from Tracy, Cal., north to Sacramento, 68 miles.

SOUTHERN PENNSYLVANIA.—Under this name a company has been organized to consolidate a number of small projected lines which have been granted charters to build. It is proposed to build a line

from Summerville, W. Va., north to the Pittsburgh district, 160 miles, with a branch from Waynesburg, Pa., northeast to Millsboro, 15 miles, and another branch west to Marietta, Ohio, 50 miles. T. F. Barrett, of New York, also Pittsburgh capitalists are said to be interested.

SPARTANBURG & NORTHERN.—See South & Western.

TEXAS ROADS.—Location surveys are being made for a line from San Antonio south to a point in Live Oak county, 70 miles. Dr. C. F. Simmons, San Antonio, is in the market for relaying rails to be used in building the line.

TINTIC RAILROAD.—Work, it is said, will shortly be started on a 10-mile line to connect certain mines with a smelter which is to be built near Eureka, Cal. Jesse Knight is the principal promoter.

TOMBIGBEE VALLEY.—This company, operating 52 miles of railroad from Calvert, Ala., where connection is made with the Southern Railway north to Healing Springs, has opened for operation an extension north to Silas, 11 miles. The line is being extended north from Silas to Butler, 24 miles. The railroad runs through a timber section and hauls large quantities of lumber to its water terminal at Nannahubba Bluffs on the Tombigbee river near Calvert. (March 15, p. 393.)

UNION PACIFIC.—This company has suspended work on its Marysville cut-off. This cut off is to run from Onaga, Kans., to Marysville, 32½ miles. About 15 miles was ready for the track, and the grading and bridging were about three-fourths finished on the rest of the line when work was suspended.

WASHINGTON, BALTIMORE & ANNAPOLIS (ELECTRIC).—An officer writes that this company has finished its double track electric line from Washington, D. C., northeast to Baltimore, Md., 40 miles. (Oct. 18, p. 473.)

WASHINGTON-OREGON TRACTION.—Incorporated in Washington with $1,500,000 capital to build 75 miles of electric lines in the vicinity of Walla Walla. The incorporators include A. H. Reynolds, C. K. Holloway, N. Baumeister, S. Drumheller, J. Smith, E. S. Isaac, W. A. Ritz and J. L. Sharpstein, of Walla Walla.

WESTCHESTER & WILMINGTON (ELECTRIC).—Application has been made in Pennsylvania for a charter by this company with a capital of $54,000. The company proposes to build 17 miles of electric line through West Goshen, Westtown and Thornbury townships, Chester county, and Birmingham and Concord townships, Delaware county. T. E. O'Connel, President, Westchester; C. P. Faucett, Treasurer, Westtown; J. A. Kirkpatrick, Birmingham; C. Gleason, Brandywine Summit; N. O'Connell, Westchester; W. Passmore, Brandywine, Del., and F. H. Day, Tallyville, Del., are interested.

WESTERN PACIFIC.—Freight, it is said, is now being carried over this road from New Hope, Cal., to Stockton, and regular trains will soon be running on the line from Stockton to Sacramento.

WYOMING SHORT LINE.—Incorporated in Wyoming with $2,500,000 capital to build a line from Grey Bull at the junction of the Big Horn and Grey Bull rivers, west via Germania and Wiley to the eastern boundary of Yellowstone Park, 100 miles. Isaac M. Hamilton, President, Chicago; C. A. Guernsey, Vice-President, Cheyenne, and S. L. Wiley, Treasurer and General Manager, Wiley, Wyo.

RAILROAD CORPORATION NEWS.

ATCHISON, TOPEKA & SANTA FE.—See Union Pacific.

BOSTON & ALBANY.—Gross earnings for the three months ended September 30, 1907, were $3,501,159, an increase of $363,226. Operating expenses increased from $1,932,519 to $2,642,831 and the surplus after charges was $95,787, a decrease of $336,949. These figures, which indicate uneconomical handling of increased traffic, show strikingly the road's pressing need of those improvements which, as mentioned on another page, it is now making.

BOSTON & NORTHERN STREET RAILWAY.—See Massachusetts Electric.

CANADA SOUTHERN.—The $14,000,000 first mortgage 5 per cent. bonds of this company, maturing January 1, 1908, are to be extended for five years with interest at 6 per cent. The Michigan Central, which leases the road, is to pay this interest. The bonds can be deposited for extension with J. P. Morgan & Co., New York, up to December 21, 1907, and the interest coupon payable January 1 will be paid at the time of deposit.

CENTRAL OF GEORGIA.—The United States Supreme Court has reversed the decision of the Georgia Supreme Court, which held that the Central of Georgia and the Georgia Railroad & Banking Co. were liable for 10 years' taxes, 1895 to 1904, on their holdings of $1,500,000 each of Western of Alabama stock. The amount of taxes concerned is said to amount to $800,000.

CHICAGO, INDIANA & SOUTHERN.—See New York Central & Hudson River.

CINCINNATI, NEW ORLEANS & TEXAS PACIFIC.—This company has, it is said, sold to Cincinnati, Ohio, bankers, $500,000 three-year 6 per cent. notes dated December 2, 1907. The proceeds are to be used for new construction and improvements.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—See New York Central & Hudson River.

DENVER & RIO GRANDE.—E. T. Jeffery, President, is quoted as saying that the 2½ per cent. regular semi-annual dividend on the $45,761,400 preferred stock was earned in the first three months of the present fiscal year. No dividend is paid on the company's common stock. The preferred dividend will be acted on at a directors' meeting on December 5.

GEORGIA RAILROAD & BANKING.—See Central of Georgia.

ILLINOIS CENTRAL.—The injunction restraining the voting of the 5,500 shares of Illinois Central stock held by the Mutual Life Insurance Co. has been dissolved, Stuyvesant Fish having asked that the suit be dismissed on the ground that the Illinois law concerning the control of Illinois railroads by outside corporations did not apply to insurance companies.

LAKE SHORE & MICHIGAN SOUTHERN.—See New York Central & Hudson River.

MASSACHUSETTS ELECTRIC.—The Massachusetts Railroad Commission has given permission to the Boston & Northern Street Railway to issue $410,000 4 per cent. 50-year bonds, and to the Old Colony Street Railway, $200,000 4 per cent. 50-year bonds. The securities are to fund floating debt incurred for construction and new equipment. Both companies are subsidiaries of the Massachusetts Electric.

MICHIGAN CENTRAL.—See New York Central & Hudson River; also Canada Southern.

NEW YORK CENTRAL & HUDSON RIVER.—An equipment trust agreement has been made with the Guarantee Trust Company, New York, securing an issue of $30,000,000 5 per cent. equipment trust notes. The equipment covered has been delivered or is about to be delivered to the New York Central & Hudson River, the Lake Shore & Michigan Southern, the Michigan Central, the Cleveland, Cincinnati, Chicago & St. Louis and the Chicago, Indiana & Southern, and these companies jointly subscribe to the agreement. Of the total issue, $20,387,000 is said to be wanted at once and it is said that this amount has been already underwritten. The notes mature in 15 equal annual instalments beginning November 1, 1908.

NEW YORK, NEW HAVEN & HARTFORD.—This company, under date of November 18, has announced the terms of the new issue of 6 per cent. 40-year debentures of which $39,029,600 are to be issued. These were described in this column November 15. They will be either coupon debentures for $1,000, or registered debentures for $100, $1,000, or $10,000. Besides being offered to stockholders at the rate of $100 in debentures for $300 in stock, they are offered to the holders of 3½ per cent. convertible debenture bonds, registered and coupon, at the rate of $100 in new debentures for each $450 of the 3½ per cent. issue. Holders of the new debentures will have the right to subscribe for any future stock issue on the same terms as stockholders; these debentures are to share pro rata in the security of any mortgage which may be created on the main line between Woodlawn, N. Y., and Springfield, Mass., or on the main line between New Haven, Conn., and Providence, R. I. Subscription warrants are to be issued in amounts of $100 and multiples. Fractional warrants are to be issued in terms of ninths. For instance, the holder of four shares of New Haven stock will receive a warrant to subscribe for one new debenture of $100 and a fractional warrant for three-ninths of a right to subscribe for such a debenture. The holder of a 3½ per cent. convertible debenture certificate for $100 will receive a fractional warrant for two-ninths of such a right. Fractional rights must be combined into subscriptions for $100 to be accepted. Holders of 3½ per cent. debentures must have their certificates stamped by the fiscal agent of the company to secure the right to subscribe. (November 15, p. 606, and November 8, p. 574.)

OLD COLONY STREET RAILWAY.—See Massachusetts Electric.

UNION PACIFIC.—It is said that this company some time ago sold about $20,000,000 Atchison, Topeka & Santa Fe common stock, which it owned last winter. Mr. Harriman and associates are understood to still hold $10,000,000 Atchison common, and the Oregon Short Line holds $10,000,000 Atchison preferred stock.

WESTERN OF ALABAMA.—See Central of Georgia.